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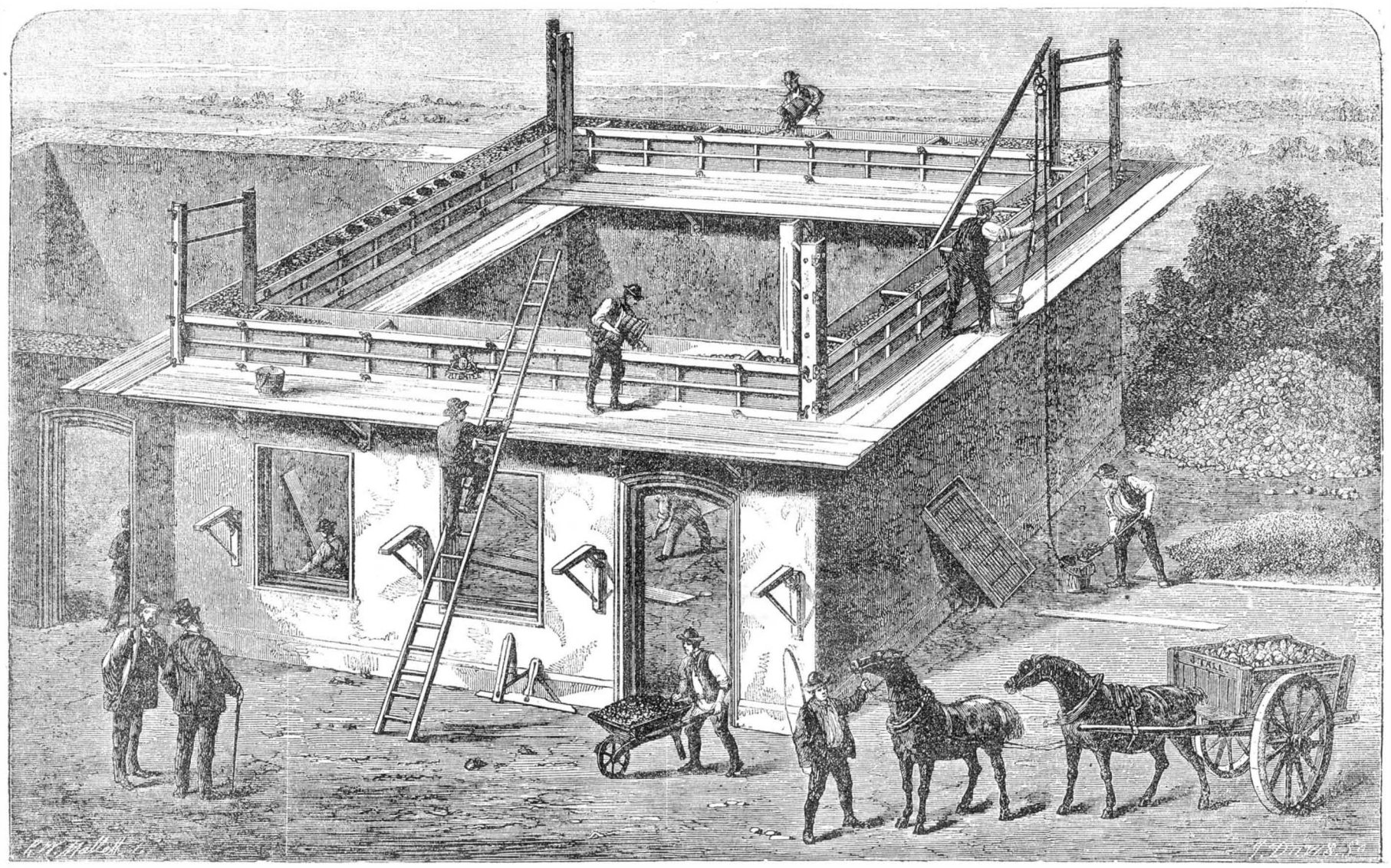
CONCRETE BUILDING.

Much interest has been taken throughout many sections of the country in the subject of concrete building. We have several times given outlines of the processes employed, and have discussed the merits of the method to some extent. Our readers will have gathered from what we have already said that we regard the method with considerable favor, and though doubtless in this, as in all attempts at improvement, there will be more or less failure at first, it is evident that this mode of building is growing in favor, both in this country and in Europe. The annexed engraving, from the *Irish Farmers' Gazette*, gives a most excellent idea of the manner in which the system known in England as Tall's system of constructing walls, houses, etc., in Portland cement concrete is conducted.



MODE OF CONSTRUCTING CONCRETE BUILDINGS.

This system has been used in the construction of a large number of houses in Paris, erected under the directions of the Emperor, who takes great interest in the improvement of the dwellings of the working classes, and has also been applied in other parts of Europe, and to some extent in the United States.

The work can be performed by ordinary laborers, who, after a four or five day's experience, acquire all the requisite expertness. Even boys have been successfully employed in this kind of building. The only skilled workman necessary is a common carpenter, whose duty is to adjust the frame-work or apparatus to receive the successive courses of material, and place joists, doors, and window-frames properly.

The apparatus is designed to construct 18 inches in hight daily over the entire extent in hand. What is done in the evening of one day is hard next morning, and quite strong, the best proof of which is, that the wall itself, as it rises in hight, supports the necessary scaffolds, as shown in the accompanying engraving. A double curb entirely surrounding the upper part of the walls, serves to hold the plastic material in place, until it acquires sufficient hardness to support itself.

The material consists of one part of Portland cement to eight parts of coarse gravel. The cement and gravel are first well mixed together in a dry state, and when this is done, it is damped by means of a large watering pot, and again mixed by a pronged drag such as is used for dragging dung out of a cart, until the entire heap has been wetted and mixed together. It is then put in iron or zinc pails, and poured into the frame, where it is leveled by men stationed for the purpose. In order to save concrete, large lumps of stones or brickbats are put into the center of the wall, and covered over and about with concrete. Frost does not affect the concrete after it has once set, which, with good cement, will be in about five or six hours. Nor do heavy rains appear to injure it in the slightest degree, though they may chance to fall ere the concrete has hardened. The walls can be made straight and even as it is possible for walls to be, and the corners as sharp and neat as if they had been formed of the most carefully dressed stone.

Concrete makes excellent floors, and the walls and floors are quite impervious to vermin of all kinds, and also to wet. Many kinds of building bricks will absorb water; hence brick houses, when the walls are saturated with water, are cold. This is not the case with houses constructed of concrete, as it is non-absorbent of moisture, and such houses must be, therefore, more healthy.

This novel mode of building homes has excited great interest in the neighborhood of Runnamoat, Ireland, and the proceedings have daily attracted numbers of people from all parts.

While concrete may be used in constructing buildings of every description, it is peculiarly adapted, from its cheapness, for the construction of cottages for laborers, and also for farm buildings. Its cost is not more than half that of brickwork; almost any material can be used along with the cement, and as we have already shown, the most ordinary class of country laborers are quite competent to carry out the details of the system. With reference to its adaptability for large buildings, we may mention that a warehouse 70 feet long, 50 feet wide, and 60 feet high, five stories in all, has been erected on Mr. Tall's system for Mr. H. Goodwin, Great Guildford street, Southwark, England, and that gentleman testifies in the warmest terms to its satisfactory character, and is making arrangements at the present time for the construction of another similar building. The warehouse already erected has attracted universal admiration from the practical and scientific gentlemen who witnessed its erection.

The chief element of success, when the cement is of good quality, seems to be the thorough mixture of the dry materials, to secure uniform strength, the whole process is extremely simple, and by the aid of our illustration cannot fail to be readily comprehended.

We are informed that some dwellings of this character are soon to be erected by Mr. Charles Kamlah, at Rutger Park, Belleville, N. J., on ground purchased by the New York Co-operative Building Lot Association, a short distance from New York, on the Newark and Paterson branch of the New York and Erie Railway.

BALLOON MAKING.

From Once a Week.

The great Captive Balloon, which has for some months past been exhibited at Ashburham Park, near Chelsea, has been removed from London—to the sea side, we hear—and having availed ourselves of a tolerably clear day, for making an ascent in it, during the last week of its stay, we propose to furnish our readers with an account of our aerial journey; and further, to exhibit the progress of aeronautic science, by prefacing our account of M. Giffard's balloon, with a few words about the first aerial machines that were seen in this country and in France. We have lately received from San Francisco accounts of a machine combining the qualities of a balloon and a ship, which is propelled by steam, and is said to be easily steered in any direction at the pleasure of the man at the wheel. If so, the great problem of aerial navigation has at last been solved, but until we see the aerial ship successfully brought into port, we shall not be inclined to believe the stories circulated by the San Francisco journals.

Since the days when Daedalus and Icarus made their fabled flight over the Ægean, on wings fastened on their shoulders with wax, down to the present time, the construction of a machine, as fitted for navigating the air as a ship is for sailing on the sea, has been a task essayed by many men of scientific pursuits and mechanical ingenuity, and their efforts, as everybody knows, have hitherto been anything but successful; indeed, the history of aeronautic science is a story of failures. The first inventor of a balloon discovered the practicability of ascending into the atmosphere, and the latest professors of aerial navigation have been able to show us but little more. A good deal of interest attaches to the early balloon ascents; the Montgolfiers were the first persons who constructed a bal-

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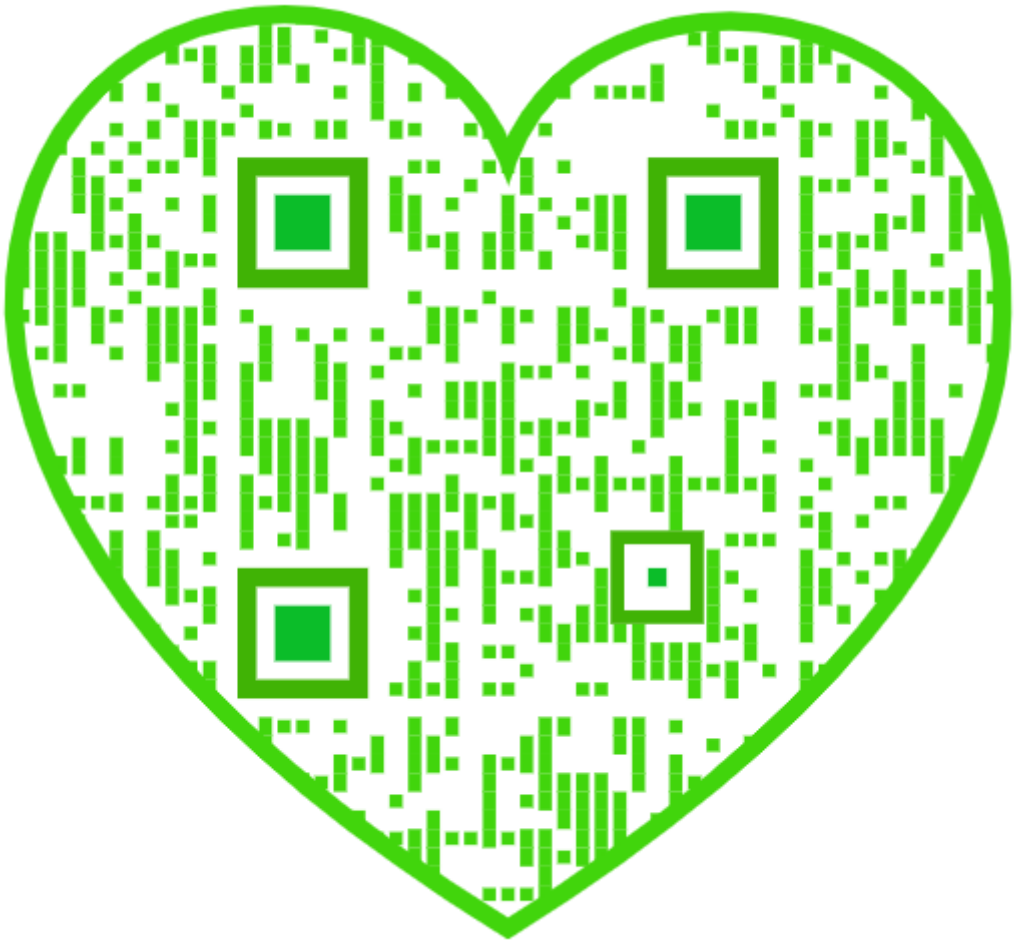

loon; although scientific men were acquainted with the principles upon which such apparatus should be constructed for some years before 1783, when the brothers Joseph and Stephen Montgolfier exhibited their balloon at Annonay, a little town in France.

It was on the fifth of June in that year, when the members of the provincial meeting of the States of the Vivarais were assembled in the town, that the Montgolfiers made their first public experiment. Their balloon was merely a spherical bag, made of pieces of coarse linen, loosely buttoned together, and inflated with rarified air, produced by kindling a fire underneath it. The fire, having been lighted, was constantly fed with small bundles of chopped straw until the balloon was sufficiently distended, when it was loosed from its stays, and rose with an accelerating motion until it had reached a considerable elevation, when its velocity became constant. It rose to the height of about a mile, and then gently descended, falling in a vineyard without the town of Annonay, having been suspended in the air for the space of ten minutes. This successful experiment delighted all who witnessed it, and the two Montgolfiers were rapturously applauded by their fellow townsmen. In Paris on the 27th of August, in the same year (1783), a similar ascent was shown to a great crowd of people assembled on the Champ de Mars: this balloon was constructed by MM. Robert and Charles, and was made of thin silk, and inflated not with rarified air, as the Montgolfiers' had been, but with hydrogen gas. The success of this experiment was complete, as the balloon rose rapidly into the air, and after traveling fifteen miles in three quarters of an hour, fell in a field near Ecouen.

Shortly after this the brothers Montgolfier were invited by the Academy of Sciences to repeat their experiment of Annonay on a larger scale in Paris. The invitation was accepted, and accordingly on the 19th of September, they sent up a balloon from the grounds of the palace at Versailles. On this occasion a sheep, a cock, and a duck were put in a basket attached to the balloon, and were the first animals ever carried up in the air in this way. They came down safely enough from their voyage, and this probably suggested to M. Pilatre de Rozier the idea of making a similar experiment in his own person; for when the Montgolfiers next sent up a balloon, he boldly leaped into the car or basket just as the machine was leaving the earth, and enjoys the fame of having been the first man who ventured upon an aerial voyage. The account of these balloon ascents in France of course reached England in due time, and created great excitement among the scientific and the curious. The accounts given in the London *Chronicle* at the time are very amusing.

'The first balloon seen in England was constructed by an ingenious Italian named Zambeccari; it consisted of oiled silk, and was about ten feet in diameter, and its exterior was entirely gilt. It made its first ascent in November, 1873. It appears to have attracted the attention of George III., for on the 25th of the same month we find this account in the *Chronicle:* "By His Majesty's desire, Mons. Argeue, a Prussian, had invented one of these celebrated air balloons, and on Tuesday, about noon, the whole apparatus was brought into the Queen's garden at Windsor, in near y the following order: A large tube of about five feet in diameter, about one-third filled with water, and in that a close vessel of considerable less size. Near to these was placed a large table, on which were put several bottles, supposed to contain a variety of chemical preparations, and with them the (Wonder of the World) the air balloon, which bore an exact resemblance to a bladder that was void of air or water." The balloon was then inflated with gas, and, "as soon as the business had gone thus far, a string was fixed to the balloon. His Majesty then took hold of the string, and in proportion as he gave it scope or pulled it down, the ball rose or returned. The King finding it so manageable, went under the window where the Queen and the Duchess of Portland were, and gave the globe a space of string till it rose to the hight of the window, and there kept it in poise for a considerable time. From thence he went to the window where the Princess Royal, Princess Augusta Sophia, and Princess Elizabeth were, and let it up again: then brought it down and taking it on his hand, said, 'Now, it goes.' It accordingly ascended in a perpendicular manner for upwards of three minutes, when having taken a southerly course, it was lost to the sight of the numerous body of spectators."

While his Majesty King George was treating his wife and daughters to an ocular demonstration of the truth of the stories told about balloons, his subjects remained very incredulous on the subject, particularly having doubts as to whether anybody was foolhardy enough to go up in them; accordingly the *Morning Chronicle* takes the trouble to get reliable information about the French balloons, and on the 11th of December, 1783, has an article headed "Air Balloons," from which we make a short extract:

"As many persons in this kingdom still discredit the relations conveyed in the French papers respecting the air balloons, we have the authority to use Dr. Lettsom's name for the following genuine communication from his correspondent at Paris, dated the third of this month: 'On Monday, an air balloon made of taffety, covered with a solution of gum-elastic, was filled with inflammable air, under the direction of Messrs Charles and Robert, and was let off from the Tuileries. It had suspended to it a basket, covered with blue silk and paper finely gilt, in the shape of a triumphal car or short gondola, in which Mr. Charles and one of the Roberts embarked, and mounted up into the air, from among many thousands of people of all ranks and conditions. Besides the Duke de Chartres and a great part of the French nobility, there were present the Duke and Duchess of Cumberland, the Duke and Duchess of Manchester, and many other foreign princes and nobility. The triumphant cars of Venus, Medea, and various others, seemed to be realized; with this difference, this was neither drawn by peacocks, doves, or dragons; neither was it mounted on a cloud; it was, however, a most majestic spectacle.'"

This authentic narration of a balloon ascent in France was calculated to allay suspicion, and prepare the public mind for a further draft upon their credulity, to which the *Chronicle* treated them to the following effect:

"It is well known that a pair of wings and a tail of the most curious workmanship are constructing for a person, who, in the spring, is to be sent off upon an air balloon. They are to extend twenty yards each way, and in form to be similar to those of a bat, having silk instead of feathers. With the help of the wings and tail, the man, when extended on the air balloon, will be able to guide himself to whatever part of the country he may wish to go. The wings above mentioned are making at the instance of a person of very high rank in Paris, and who has betted 5,000 guineas that the foreigner who has undertaken this scheme makes a safe passage from Dover Cliff to Paris."

What became of the poor foreigner who proposed to emulate the feat of Daedalus and fly across the sea, we do not know; but we think we may say with certainty that the person of very high rank lost his wager and his guineas.

Soon after this, balloon ascents became common enough in England. The first person who went up in a balloon on the 21st of September in the following year, and from that this side of the Channel, was a countryman of Count Zambeccari's, named Lunardi, who made an ascent from London on time to this no very important improvement in the arts of constructing aerial machines has taken place; the grand desideratum is to discover a means of steering them. Fans or paddles have been made to answer the purpose in the still atmosphere of a covered building, but heretofore all efforts to make a rudder capable of withstanding strong currents of wind have altogether failed of success.

Johnson's remarkable acumen displayed itself in the discussion of the practical value of the new machines as a means of locomotion. He writes to his friend and physician, Dr. Brocklesby, September 29, 1784: "On one day I had three letters about the air balloon. . . . In amusement, mere amusement, I am afraid it must end, for I do not find its course can be directed so as that it should serve any useful purpose." And again in a letter addressed to the same gentleman, and dated Oct. 16, Dr. Johnson says: "The fate of the balloon I do not much lament; to make new balloons is to repeat the jest again. We now know a method of mounting into the air, and I think are not likely to know more; the vehicles can serve no use till we can guide them." And in the art of guiding them no progress has been made during the eighty or ninety years that have elapsed since they were first constructed. They are, what they were, nothing more or less than ingenious toys; and during that interval the history of balloons is but an account of ascents, either as a holiday attraction or for the purpose of scientific inquiry into the state of the atmosphere at different hights from the earth's surface. In connection with these the names of Messrs. Glaisher and Coxwell deserve a word of recognition. A new interest, however was given to the subject, by the arrival in London of a balloon of gigantic size, designed by M. Giffard, a French engineer, at the beginning of last summer. The novelty in this instance consisted in the great balloon being held captive by a conical rope, equal to a strain of five and twenty tuns, 2,150 feet in length, and paid out and coiled again by steam engines of 200-horse power. A certain amount of danger had attended ascents in the old balloons, as when once in the air it was a matter of the purest conjecture where and how you might alight again on ground. But M. Giffard, by attaching a rope to his balloon, offered the opportunity of an aerial voyage unattended by such risk, as you were lowered again into the amphitheater of wood and canvas whence, a quarter of an hour before, you had started on your journey.

With the exception of one little escapade—a run down into the Vale of Aylesbury with no one on board—the balloon has worked very satisfactorily, although the season has been very unfavorable for aerial navigation. Having chosen a fine day, we proceeded to Ashburham Park, and arrived there at about four o'clock in the afternoon. On entering the amphitheater, of course the object that prominently struck you was the balloon, fastened by the rope to a pivot wheel in the center of the arena. It is an enormous spherical bag, made of three layers of canvas, inclosing one layer of india-rubber, and is inflated with pure hydrogen gas, made in retorts on the premises at Ashburnham. The cost of filling it is upward of £600; and this will give some idea of the magnitude of this monster balloon. After a delay of about an hour, owing to the state of the wind, about five o'clock the balloon made a trial trip, having in the car M. Aymos, and three others of the assistants. All working smoothly and well, she was lowered again into the circle, and about twenty persons, of whom seven or eight were ladies, entered the car; and the great balloon having been let slip from her stays, we rose with an easy and majestic motion into the air. After reaching a hight of about 400 feet, at a signal from the car—a white flag—the engines were stopped, and we remained stationery for some minutes. We were now at about the hight of the cross on St. Paul's, and the view was extensive and beautiful. At a signal from the car, we again mounted into the air; and, after a second halt, we finally rose to a hight of about 1,500 feet, the balloon being drifted slightly in an oblique direction by the wind. This was about four times the hight of St. Paul's. Unfortunately, the day was anything but clear, and so the panorama visible from that elevation on a perfectly clear day was much curtailed; but we could see Highgate, Richmond, Brentford, and Wimbledon, in a northern and western direction; while Eltham was pointed out to the east, and Greenwich and Woolwich to the south. Having remained for a few minutes at that hight, we were slowly lowered again into the arena. As we descended, the bridges on the river looked in some places scarcely further apart than the rounds of a ladder. Neither in ascending or descending was the motion at all unpleasant; and the ladies seemed to apprehend no cause for alarm.

After having spent about twenty-five minutes in the clouds, we safely disembarked again at Ashburnham, much gratified with our aerial trip, and with nothing to regret but the hazy state of the atmosphere, which, to a great extent, curtailed the prospect we should otherwise have enjoyed at so unusual an elevation from the busy world.

The Influence of Weather on Sickness.

Dr. Ballard, in his Report on the health of Islington, for 1867, thus aphoristically states the influence of the weather on sickness:

1. That an increase of atmospheric temperature is normally associated with an increase of general sickness. 2. That a decrease of atmospheric temperature is normally associated with a diminution of general sickness. 3. That for the most part the increase or decrease of sickness is proportional in amount to the extent to which the atmospheric temperature rises or falls. 4. That it is an error to suppose (as is popularly held) that sudden changes in temperature are (as a rule) damaging to public health. A sudden change from cold to hot weather is indeed very damaging; but a sudden change from hot to cold is one of the most favorable circumstances that can occur when sickness is regarded broadly as respects a large population. 5. That, remarkably enough, these influences are most marked in the directions I have mentioned in the colder season of the year, and more certain in the winter than in the summer. 6. That rises and falls of temperature are more certain and effectual in their special operation upon public health when at the same time the daily range of temperature is lessened, than they are when the daily range is at the same time increased; rises of temperature increasing sickness more certainly and markedly, and falls of temperature decreasing it more certainly and markedly. 7. That a fall of rain lessens sickness generally, sometimes immediately, sometimes after a short interval, and that, as a rule, the reduction of general sickness is greater when the fall of rain is heavy than when it is light. 8. That drought, on the other hand, tends to augment general sickness. 9. That wet weather in the summer season operates more certainly in improving public health than it does in the winter season.

Retarding the Growth of Strawberry Vines.

George Burson, of East Palestine, Ohio, has recently patented the following for the above purpose:

The plants are carefully packed in boxes, two feet six inches in depth, which are filled with sufficient soil to prevent the roots from being exposed to the air, and at a sufficient distance from the surface of the ground to secure a uniform temperature of from 40° to 42°. This should be done late in the fall or early in the spring, and is, of course, impracticable, except in the vicinity of abandoned mines.

The second method consists in placing the plants in boxes, as above described, in early spring, and packing them in sawdust and ice within an ice-house, but as ice-houses are not always convenient or accessible, this method also possesses some objectionable features, which, however, do not exist in the third method, which can be employed in all sections of the country, except in the extreme Southern States. The vines, are, as before, packed in boxes in the fall, and after being slightly covered with sawdust, are exposed to the weather until the soil is frozen hard, when the boxes are piled together, covered with from eight to ten inches of sawdust, and exposed until March, when they should be thickly covered with straw. When thus treated, the plants will remain in a frozen condition until late in summer, or until fall. While kept in this condition, vegetation remains suspended, and in order that a continuous supply of strawberries may be had, from their usual seasons until late in the fall, it is only necessary to remove from the boxes a sufficient number of plants each week, which must be placed in the ground and cultivated in the usual manner.

What is claimed as new is the herein-described treatment of strawberry plants for the purpose set forth.

Cement.

Edward Heylyn, of Rochester, N. Y., has lately patented the following cement:

Melt forty-six pounds of resin, and five pounds of linseed or other oil or grease in an iron pot; and, when nearly melted, put in eighty-four pounds of dry calcined plaster of Paris, twenty pounds of white sand or brown sand, and twenty pounds of the refuse matter from the pipes and retorts of gas works, said dust being both of a brown and black color. Let them boil, and while boiling mix the ingredients by stirring and mixing, with an iron fork with a wooden handle, and when all mixed, pour the same into casks or molds ready for use.

Depositing Metals on Fibrous Materials.—Silk, muslin, or other fibrous materials, may be covered with silver, copper, or gold, by the electro-plating process, thus: Make a solution of sulphate of copper in liquid ammonia; dip the materials in this, and dry them; then place them in a solution of honey or grape sugar in water at a warm temperature. The sugar will thus decompose the copper salt, and deposit metallic copper on the fiber. The silk or muslin may now be transferred to the electric bath, and receive a deposit of such metal as is desired.—*S. Piesse.*

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APPLICATIONS OF PHOTOGRAPHY TO ASTRONOMY.

In taking celestial photographs the telescope is used as the camera, the sensitive plate being usually placed in the focus of the object-glass or mirror, and receiving the image directly upon it. From the impression thus produced enlarged copies may be subsequently taken. Sometimes the image is enlarged by a secondary magnifier before it is received upon the plate. Either the telescope or plate-holder must, of course, have a uniform motion communicated to it during the exposure corresponding to the motion of the object. A negative, when obtained with a clear and tranquil atmosphere, and free from all imperfections—such as are caused by a floating atom of dust, or the slightest tremor of the instrument, or pinholes in the collodion film—may be enlarged so far as to make apparent the minute granules of deposited silver used in the photographic process; but here is an end to the advantage gained by increase of size, no more detail being furnished by any further enlargement.

WONDERFUL RAPIDITY OF PHOTOGRAPHIC ACTION.

The image of the full moon can be fixed in less than one-fourth of a second, and that of the sun "instantaneously." According to the experiments of Mr. Waterhouse, a space of time no longer than one twenty-seven-thousandth of a second is required to fix the solar image. Even this small fraction, however, inconceivably short as it appears, is a tolerable length of time compared with that in which photographs are taken by the electric flash. The duration of the illuminating spark, according to the beautiful and trustworthy experiments of Mr. Wheatstone with his delicate chronoscope, does not exceed the *millionth* part of a second, and yet a clear and distinct photographic image is obtained by a single electric discharge. By this means may be shown the real form of objects to which a deceptive appearance is given by their rapid movement. If a wheel on whose side any figure is drawn in conspicuous lines be made to rotate with the greatest possible velocity, the figure will present to the eye only a series of concentric bands of different shades. Let it now be photographed while in motion by the electric flash, and the wheel will appear stationary with the figure perfectly well defined. A vein of water issuing from a small orifice, which appears to the eye as smooth as a stem of crystal, if seen or photographed by the light of the electric discharge, is shown to be composed of drops variously disposed and of various forms, some being elongated, others flattened, and others almost spherical.

THE MOON AND PLANETS IN THE STEREOSCOPE.

In combining pictures of the moon for the stereoscope, two photographs of the same phase are taken, but with an interval of one or more months between, in order that it may present in the latter picture its disk slightly turned from its position in the former, making the difference of libration from five to ten degrees—the two pictures, in fact (placed in a stereoscope), representing the moon exactly as it would appear if our eyes could be separated thirty thousand miles apart and each view the moon through a telescope at the same time. By the effect thus produced, the *globular form* of our satellite is demonstrated as a physical fact, being made as apparent to the eye as is that of an orange held in the hand. The telescope exhibits the inequalities of the moon's furrowed surface only as differences of light and shade, while the stereoscope reveals them as actual elevations and depressions, making as manifest the long mountain ranges and deep valleys, the isolated peaks and numerous saucer-like cavities or craters, as they would be in a bird's-eye view to a lunar inhabitant.

Ordinary stereoscopic pictures of the moon represent it as magnified from twenty to twenty-five times; a common stereoscope further magnifies it about one and a half times, so that it is seen under a power of about thirty-five.

The configuration of Jupiter's belts, and the diversity of light and shade on the surface of Mars, have enabled stereographs to be produced of those planets, the presence of detail or variety in the appearance of a body being necessary to their production. Mr. De La Rue hopes to obtain a sterograph of Saturn and his rings by the aid of the latter's periodical change of appearance in opening and closing. An interval of several years between the two photographs will be necessary. The planet itself will probably present only the appearance of a flat disk from the want of sufficient detail on its surface.

At Kew Observatory, near London, the sun's photograph—we might say autograph—is taken once or twice every day when the sky will permit. By this means we are obtaining a continuous history of the changes in the spots and faculæ on its face more accurate and more instructive than could be procured in any other way. An investigation of these sun-pictures is fast setting at rest many disputed points pertaining to solar physics. The existence of a comparatively cold atmosphere around the sun, outside of the luminous matter, and the connection of the solar spots with planetary influence (chiefly that of Venus and Jupiter), have been already established by them. Other questions relating to spots on the sun, and their connection with terrestrial magnetism, it is thought, will soon be solved, and perhaps all those concerning the movements of the supposed ring of asteroids (or, possibly, single planet) within the orbit of Mercury. An investigation is now being made with the view of determining with greater exactness the angular diameter of the sun.

MAPS OF THE HEAVENS.

But perhaps the most desirable application of photography, to the accomplishment of which the hopes of astronomers are strongly turned, is its employment in mapping the sidereal heavens. Mr. Rutherfurd, with his eleven-inch photographic object-glass, has carried the work in this direction to the farthest extent yet attained, having photographed stars of the ninth magnitude. He has taken one cluster of twenty-three stars within the space of one degree square, and another (the Pleiades) of forty-three stars, many of these being of the ninth magnitude, with an exposure of from three to four minutes. With a delicate micrometer, which he designed expressly for the work, Mr. Rutherfurd took careful measures of the star images in his photograph of the Pleiades. From these measures Dr. B. A. Gould has deduced the relative position angles, and distances (in arc) of the stars, and a comparison of his results with those obtained by Bessel from his observations of the same stars proves both the accuracy of Bessel's measures and the trustworthiness of the new method, while at the same time it shows the small amount of relative change which has taken place in this group during the last quarter of a century. The observations made by Bessel extended over more than eleven years, while the observations of Mr. Rutherfurd were made in a single night.

ADVANTAGES OF PHOTOGRAPHIC OBSERVATIONS.

The advantages of this method of observation, when so extended as to apply to the smaller telescopic stars, as stated by Prof. Bond, are its entire immunity from personal errors, errors of judgment or from want of skill on the part of the observer, with less liability to ordinary mistakes in reading and recording the indications of the micrometer. Besides which, the permanent record can at any time be re-examined to clear up doubtful points. Another advantage, equally decisive, is the extraordinary rapidity with which groups or clusters of small stars would be delineated, saving months and years of labor.

"The possibility," says M. Faye, "of dispensing with the observer (whose 'personal equation' varies not only with years, but from one moment to another, with the troubles of digestion, circulation, or nervous fatigue) has been fully demonstrated. The method consists in substituting for the eye a photographic plate, and in automatically registering by electricity the instant when the light is admitted to the dark chamber attached to the telescope." By this means M. Faye obtained in twenty seconds ten complete observations of the sun. Again, while the observer, in looking at an object, scrutinizes closely only the parts which specially interest him at the moment of observation, and nearly always permits the rest to escape his attention, the photograph, on the contrary, permanently registers every thing alike.

A recent example has shown that it is not always safe to rely on the appearance of exactness even in science which boasts of its perfection. It was supposed that the observations of the last transit of Venus across the solar disk in 1769 gave the sun's mean distance from the earth very correctly. But it is well ascertained to-day that the adopted value of this distance, which is the astronomer's measuring rod for celestial spaces, is too great by more than three millions of miles. Transits of Venus will again occur in 1874 and 1882, and it is proposed to employ the new and more accurate method in observing the phenomenon, though not designed that it should supplant observations with the eye.

It is well known that "the eternal and incorruptible heavens," as they were termed by Aristotle, are undergoing continual and marked changes. The so-called fixed stars—the "landmarks of the universe"—have their own proper motions not accounted for by that of the solar system. Sirius—as that wonderful aid to physical astronomy, the spectroscope, reveals—is shooting through space at the rate of a thousand million miles a year. The star known at 61 Cygni has a transverse motion alone of one thousand four hundred and fifty million miles a year. Many stars, more distant still, may even exceed this rate. Cooper's recent catalogue of stars shows that no fewer than seventy-seven stars previously catalogued are now missing. This, no doubt, is to be ascribed in part to the errors of former observations; but it is certain that to some extent at least it is the result of changes actually in progress in the sidereal system. Of temporary stars, about twenty have been observed, and more than six times that number are known to be variable. It appears quite certain also that some of the nebulæ have undergone a change for both form and brilliancy. When the celestial lamps shall by their own light record their history on the photographic page, our knowledge of these mysterious luminaries, whose fires wax and wane, or go out in utter darkness, will be less involved in doubt.

GREAT TELESCOPES NOW BEING MADE.

Mr. M. De La Rue is having a lens constructed of thirteen inches in diameter, soon to be in operation, from which, in the hands of so skillful a director, much is expected. Prof. Henry Draper has very nearly completed a new silvered glass reflector of twenty-eight inches diameter (the largest of the kind yet constructed, except one by Foucault). With this instrument the original negatives will be taken six inches in diameter, with provision for extending them to nine and a half inches if desirable. Such pictures will, of course, contain an amount of detail not possible in those taken with ordinary instruments, which vary from one to two inches in diameter, according to the size of the telescope. Prof. Draper expects thus to obtain photographs of larger size and sustaining higher magnifying power than any that have yet been produced. The amount of advantageous enlargement will not be limited by the appearance of the silver granulation, but will depend wholly on the sharpness of definition obtained in the original picture.

There is now being erected (if not already completed) at Melbourne, in Australia, a powerful reflecting telescope four feet in diameter, of the Cassegrain form, which will be supplied with the necessary apparatus for photography, as well as for spectroscopic investigation. This derives its importance chiefly from the fact that the work will be prosecuted in rich fields of the southern hemisphere.

THE BEST PLACES FOR OBSERVATION.

It was suggested by Newton that the serene and quiet air which is so often found on the tops of mountains above the grosser clouds would very much favor celestial observations. Such elevated stations would seem to possess peculiar advantages for the application of photography, since the atmosphere is not only less subject to disturbance, but is also more favorable to the chemical action of light. The results of the expedition to Teneriffe in 1856 prove these suppositions correct.

In a paper presented to the British Association in 1863, Prof. Piazzi Smith, who had charge of the expedition, states that the chief object at Teneriffe was to ascertain the degree of improvement in telescopic vision at a high elevation. Observations were taken at various points, reaching an altitude of eleven thousand feet, or a little more than two miles. At that hight the majority of clouds were found to be far below, the air dry, and in a very steady and homogeneous state. A photograph taken near the sea level could not be made to show the detail on the side of a distant hill no matter how marked the detail might be by rocks and cliffs illuminated by strong sunshine. Even the application of a microscope brought out no other feature than one broad, faint, and nearly uniform tint. But on applying the microscope to photographs of distant hills, taken at a high level, an abundance of minute detail appeared. Each little separate bush could be distinguished, though the hill side was four and a half miles from the camera.

The important results obtained by this expedition has led to the establishment by the Russian Government of an astronomical observatory at an elevated station on Mount Ararat, near Tiflis.—*Professor Merriman in the Methodist Quarterly.*

Teleiconographe.

M. Revoil, an architect well known in France, in the course of his attempts to arrive at exactness in the drawings of distant objects, by the aid at one time of the camera lucida, and at another, of the ordinary telescope, has invented an apparatus combining the principles of the two instruments. This instrument he calls the Téléiconographe. The principle involved is that of allowing the image transmitted by the object glass of a telescope to pass through a prism connected with the eye-piece. The rays of light that would in the ordinary use of the telescope be transmitted direct to the eye, are refracted by the prism, and thrown down upon a table placed below the eye-piece. The distance between the prism and the table determines the size of the image projected on the latter, and it is easy for the observer to trace on a paper placed on this sketching table the actual outlines indicated by the refracted light. The telescope has both vertical and horizontal motion, and is so constructed that a connected drawing can be made of a larger area than can be included in the object-glass at one view; in fact, an entire panorama can be traced, if the relative positions of the axis of the telescope and the surface of the sketching table are undisturbed. The account from which the above description is taken, states that by means of this instrument a perfect drawing of the summit of one of the towers of Notre Dame Paris, was made at the distance of 300 yards, and also that two mountain peaks, in Provence, were most admirably sketched. For the faithful delineation of objects so distant as to require the use of a telescope to distinguish their details, for military surveying, &c., its services promise to be of great value.

Wasteful Mining in California.

The San Francisco *Bulletin*, speaking of mining interests in that region, says:

"It will be well for the State when all of our mining interests shall pass into the hands of private individuals, for then there will be no question as to the right of taxation; and besides, the sooner the timber throughout the mountainous regions of California shall be protected, the better it will be for the people.

"Waste has been going on in the mines since 1849. There have been waste in working mines, waste on timber lands, and in fact waste in nearly everything throughout the mining region of California. There has even been wastefulness by erecting temporary buildings. Chinese have run over the placers, exhausting them of their gold, and with very little to the people. We wish to see every foot of land, not only that fit for farming purposes, but that in which there is a particle of gold, belong to individuals. When this comes about, the interior may be expected again to prosper."

THE FLOODS.—Accounts reach us of much damage caused by the recent heavy rains. All along the upper Hudson, in the Connecticut Valley, in New Hampshire, in New Jersey, and further South, we hear of broken dams and canals, damages to telegraph lines, and "wash-outs" in railway tracks. In some instances houses have been swept away and loss of life has resulted. A recently arrived passenger states that out at sea the weather was calm on the day of the heavy rainstorm which caused the floods, but there has been some damage to vessels along the coast. The storm has, however, been more beneficial than destructive, as many sections visited by it were parched with drought up to the date of its occurrence. New York city may thank the rain for cleaner streets than it has seen for six months past.

MESSRS. GRAEB AND LEIBERMANN, of Prussia, have recently obtained a patent in this country for the preparation of alizarine. They state that their process consists in first preparing bibromanthrakinon, or bichloranthrakinon, and then converting these substances into alizarine.

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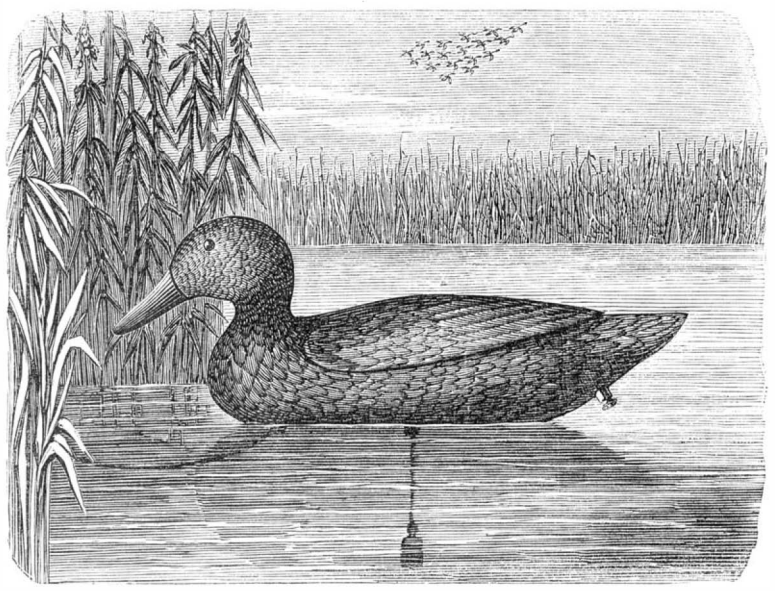
FOSTER'S INDIA-RUBBER DECOY DUCK.

This is a rubber duck of full size, and accurately formed. When not in use it can be collapsed by allowing the air which distends it to escape through a valve provided for that purpose and through which it is also inflated when it is wanted for use.

A ballast weight is fixed to the center of the belly. The resemblance to a real duck is very striking. Sportsmen will appreciate this invention, and the convenience afforded by the



portability of these decoys over the old cumbersome wooden ducks. A dozen may be packed so as not occupy more space than a single wooden one.

Patented August 3, 1869, by Jacob Foster, who may be addressed for further information, 328 Colowhill street, Philadelphia, Pa.

DIFFICULTIES TO BE SURMOUNTED IN WORKING THE SUEZ CANAL.

We find in *Lippincott's Magazine*, a paper from the pen of Edward B. Grubb, relating "what he saw of the Suez Canal during a trip from Timsah to Port Said last winter. In this article we find set forth some of the difficulties to be surmounted in the navigation of this canal, which though possibly not insuperable, must more or less obstruct trade for some time to come. We make some extracts from this interesting narrative particularly bearing upon this subject:

"Where the canal enters Timsah from the north the cuttings are deep, and the great heaps of sand lie on either side sixty or seventy feet high. The channel through which the water runs is not one hundred feet wide and the depth not over twelve feet. Hydraulic engines of enormous power were at work dredging up and pouring out immense volumes of mud and sand. Hundreds of men, mostly Arabs, with barrow, pick, and shovel, were moving the huge heaps, or waist-deep in the water, turning from our path their uncouth boats; for much traffic is even now done upon the canal, and besides the boat-loads of stores and provisions belonging to the company, we saw many a cargo that reminded us of the sutlers' stores in the 'Army of the Potomac.'

"The Timsah cutting extends for perhaps half a mile, and then the desert is scarcely above the level of the water, and in fact in many places it is below it, so that the water covers many hundreds of acres, and the course of the canal is buoyed out sometimes for nearly a mile. As we left the hills of Timsah the wind struck us sharply, and ever and anon a quantity of the light sand of the desert would be caught up by it and sent whirling into the water; and looking closely, we could see where it had drifted little capes and promontories into the canal. Let us repeat what our captain said upon this subject, being asked:

"'Yes, monsieur, this drifting in of the sand certainly seems to be one of our greatest difficulties, for the wind blows across the canal all the year round—six months one way, six months back. One ounce of sand per square yard amounts to five hundred tuns for the whole canal. If it came in at that rate, it would be a long time before the company would pay any dividend. But we do not intend to let it come in; and this is how we prevent it. This sand only extends to the depth of from nine to twelve feet; below this is a stratum of blue mud, mixed with a sort of clay, in which, by the way, we find great quantities of beautiful shells and fossil fish. Well, then, do you see those two huge engines which we are approaching—one an hydraulic dredger in the middle of the canal, the other an iron *shute* (it looked like the walking beam of an immense steamer), near the edge? Do you see how the vast masses of sand, mud, and water, come up from the dredger, are poured out into the "shute," and thence on the ground sixty or eighty feet from the edge of the canal? Do you see how quickly the great heaps rise, and how they extend, almost without a break, all along? Well, monsieur, you would find these heaps almost immediately baked hard by the sun, and as they are firm enough to bear the railroad we intend putting upon them the better to expedite the mails from India, so we hope they will be high enough to keep out the sand drifts from the canal.

"And what are your other great difficulties, mon captaine?"

"Well, monsieur, at Chalouf, near Serapéum, we have struck a peculiar hard stone at the depth of twelve feet, and are obliged to blast to clear it out (it is axolite). Then the deposit of the Nile mud near Port Said will always keep us dredging. But what we fear most is the Red Sea. For a long distance from Suez it is extremely shallow; then, lower down, it is very rocky; and while this is nothing to steamers, which can easily keep the narrow channel, yet with the wind blowing six months one way and six months the other, it will not be easy for a heavily-laden clipper to keep off the ground. Yet these things will all be set right, for trade will take the shortest route, and the Suez Canal will be a success, although no nation now believes it except France, and (with a bow) America.'

"A few words now upon the canal in general. Whether or not the idea originated with Pharaoh, Napoleon I. acted upon it, and actually had a survey made, when it was reported that there was a difference of thirty feet in the level of the two seas; and for that and other reasons the project was abandoned, and lay dormant until about 1854; upon the 30th of November of which year the contract between the Egyptian government and "Compagnie Universelle du Canal Maritime de Suez" was signed. Its duration is ninety-nine years from the day of the opening of the canal for traffic. The Egyptian government is to receive fifteen per cent of the net profits, and holds a large proportion of the company's bonds. Egypt conceded to the company all the lands which might be irrigated by the fresh-water canal, and in 1868 bought back its own concession for a sum equal to ten millions of dollars.

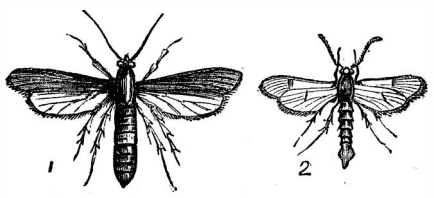
"Kantara is thirty-one miles from Port Said, and the canal is almost perfected thus far; that is to say, although the dredges are still at work, yet for this distance the canal is one hundred yards wide and of an average depth of twenty-six feet; and these are to be the dimensions for its entire length. A curious feature, which is visible along the narrow parts of the canal, is a current flowing in from the north at the rate of one and a half knots per hour. Although it is many months since the water attained its level, yet this current still continues. Our captain attributed it to evaporation and absorption. It must be remembered that all the cuttings have been from the Mediterranean towards Suez, and that the main body of the men employed, numbering eighty-five hundred, are working at the head of the canal, which is now advanced as far as Serapéum. Here it is necessary to cut through a number of sand hills to the Bitter Lakes, which are a series of depressions in the desert, in the lowest parts of which are marshy ponds. They are twenty-five miles in extent, and it is expected that, when the water is let in, an area of one hundred and forty thousand acres will be covered. (This has since been done). Then comes the Chalouf cutting to Suez, sixteen miles, and the seas meet.

"On the 1st of January, 1869, there were at work eighty-five hundred men. These men are obliged by the Egyptian government to work on the canal, but are paid by the company at the rate of two francs per day. The engines for dredging are sixty in number. Each cost two hundred thousand dollars in gold. The expenses amount to one million dollars in gold per month, and the work has already absorbed forty millions of dollars. It is said that the rates of toll are to be ten francs per tun. The company is a private one, and has not been publicly recognized or assisted by the French government.

"With regard to the rocks, the calms, and the tortuous channels of the Red Sea, mentioned before as the chief obstacle to the use of the canal by the larger class of merchantmen, plans have already been elaborated in England, with a view to the building of a class of vessels suited to this trade, and carrying each sufficient steam power to assist her through the canal and down the Red Sea. For the dispatch of mails and the transport of troops, this route will be immediately available; and although it will take time to conquer English prejudices and predilections, yet in time the bulk of the India trade must come this way."

THE PEACH TREE INSECT.

The "Peach Borer" is becoming extinct in many parts of the West, and the peach trees are beginning to thrive again. Mounding up the trees with earth has been long practiced, as a preventive against the borer worm; but writers in the *Entomologist* say it does no good. Peach orchards, where hogs are allowed to run, seem to be kept free from the insect. Lime and ashes are of no value.

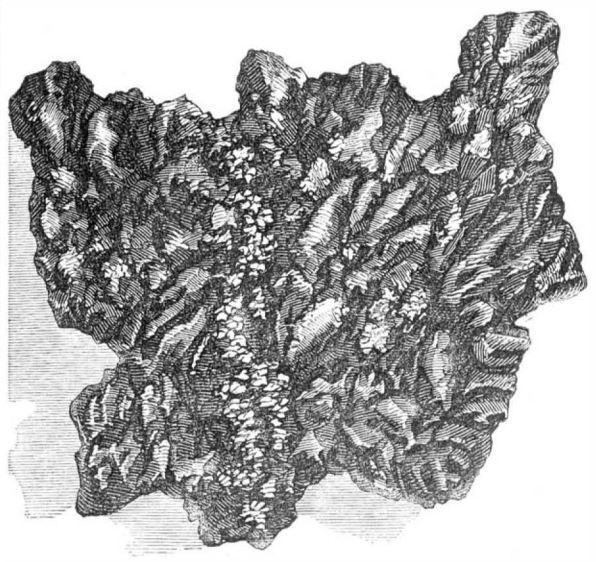


The above illustration shows the moths of the borer. Fig. 1 is the female; Fig. 2, the male.

Artificial stone is made by mixing sand with a concentrated solution of silicate of soda. The pasty mass thus formed is placed in the mold of the desired shape. It is then dried, but is yet as brittle as biscuit. It is next saturated with a solution of chloride of calcium. In about an hour the chemical change takes place, and the whole mass becomes as hard as stone; finally, it is washed and dried.—*S. Piesse.*

"THE WELCOME STRANGER" NUGGET, FOUND NEAR DUNOLLY, IN AUSTRALIA.

Attention has been already directed to the many large pieces of gold which have been found in the neighborhood of Dunolly; and, when the printing of this work was nearly completed, on the 5th February, 1869, there was unearthed by John Deason and Richard Oates a nugget weighing more than 2,280 oz., 10 dwts., 14 grs. It was found on the extreme margin of a patch of auriferous alluvium trending from Bulldog Reef. According to information furnished by Mr. Knox



Orme, it appears that this mass of gold was lying within two feet of the bed-rock (sandstone), in a loose, gravelly loam, resting on stiff, red clay. It was barely covered with earth. It was about twenty-one inches in length and about ten inches in thickness; and, though mixed with quartz, the great body of it was solid gold. The annexed engraving has been reduced from a large sketch made by Mr. Francis Fearn, which was certified by the discoverers as a fair representation of the nugget found by them. Comparing it with a photograph of a sketch made from memory by Mr. Charles Webber, it would appear to represent not incorrectly the outward appearance of the "Welcome Stranger."

It is to be regretted that a cast or a photograph was not made, and the weight and specific gravity of it ascertained when it was first dug out of the ground. The discoverers appear to have heated it in the fire in their hut, in order to get rid of the quartz, and thus to reduce its weight before conveying it to the bank at Dunolly.

The melted gold obtained from it was 2,268 ozs., 10 dwts., 14 grs., but a number of specimens and pieces of gold (weighing more than 1 lb.) were detached from it before it got into the hands of the bank manager; and what was broken off in the hut while it was on the fire, it is useless to guess.

Mr. Birkmyre says: "The gold of this nugget, from the crucible assays, I found to be 98·66 per cent of pure gold. It thus contains only 1-75th of alloy, composed chiefly of silver and iron. The melted gold, with that given away to their friends by the fortunate finders, amounted to 2,280 ozs., or 2,248 ozs. of pure gold—its value at the Bank of England being £9,534."

The neighborhood of Dunolly is almost unprospected country. For many miles there are out-cropping reefs which have yielded very large pieces of gold: and it is not at all improbable that other pieces of gold will be found as far exceeding the "Welcome Stranger" in weight and value as that nugget exceeds any yet recorded.

Near the spot where this mass was found there were unearthed two nuggets weighing respectively 114 ozs. and 36 ozs. Very heavy gold is characteristic of this district; and large nuggets are found nearly every day.—*From R. Brough Smyth's "Gold Fields and Mineral Districts of Victoria."*

THE HOLSTEIN INTERMARITIME CANAL.

EARLY ATTEMPTS FOR DIRECT INTERMARITIME COMMUNICATION.

The idea of constructing ship canals across narrow strips of land, for promoting commerce, is not new. From a work of Antonio Galvao, entitled *"Tratado dos Descubrimentos,"* we note the fact that the opening of a ship canal between the Atlantic and Pacific Oceans—"the mightiest event, probably, in favor of the peaceful intercourse of nations which the physical circumstances of the globe present to the enterprise of man"—was proposed to Charles the Fifth in 1528. And, strange as it may seem, the inquiries, instituted at that time, led to the recommendation of the same lines that were planned in 1825. Still older is the project of the opening of ship canal across the Isthmus of Corinth in the Mediterranean. It engaged the attention of Periander, Demetrius, Julius Cæsar, Caligula, Herodes, and Atticus, but it was reserved for Nero to take the first active step toward the accomplishment of this end. He completed a canal half way, as lately ascertained by the explorations of the learned Frenchman, Mons. Grimaud de Caux. This isthmus connects the peninsula of Morea with the province of Attica, in Greece. By means of a canal cutting through this narrow strip of land, the route from the Ionian Sea to the Archipelago would be considerably shortened. Such a canal would be of great importance, as enormous quantities of grain are exported from the borders of the Black Sea to the seaports of the Adriatic.

The project of uniting the Baltic with the North Sea by a navigable ship canal dates from the zenith of Lubeck's commercial prosperity, and was suggested first as early as

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1390. This project occupies at the present moment the attention of the North German Parliament, and, being one that may safely be ranked among the gigantic engineering enterprises of the present age, we have endeavored to collect such accurate knowledge with regard thereto as existing sources admit.

WHY THE PROJECT WAS STARTED.

Two reasons call peremptorily for the accomplishment of a navigable route between the North Sea and the Baltic, to wit: gain in time and safety. The distance between the English canal to the open Baltic Sea around the promontory of Skagen is about 880 miles. It would be shortened for two fifths of its whole length if a straight route from one shore of Holstein to the other could be chosen. Steamers would thus be enabled to make the voyage from London to St. Petersburgh in five days, instead of seven, while sailing vessels would gain from one week to one month, according to circumstances.

The second reason for the building of a ship canal is still more important. According to even very incomplete statistical data, the annual number of losses of vessels in that portion of the sea is greater than that of any other equally large portion of the globe. This is the more to be deplored as the route around Cape Skagen is the only one from the North Sea to the coasts of Sweden and Finland, as well as to the very heart of Russia. Indeed, it has been ascertained that the yearly loss experienced on the old sea way amounts to three millions rix dollars, or about two million dollars in gold. This sum is certainly a large one, but it must be remembered that the cargoes of many vessels are exceedingly valuable. For instance, the cargoes of the American bark *Joseph Clark* and the English steamer *Arctic* amounted to half a million dollars in gold; the former vessel was shipwrecked in 1857, and the latter in 1860. These accidents mainly occur on the western coast, especially on the sand banks of Skagen, which, for this reason has been denominated "the graveyard of ships." Indeed, small and large wrecks are seen there in every condition and at every time of the year.

It may be remarked that there are now two channels across the isthmus of Holstein; they are, however, altogether inadequate to the existing demands of navigation. The one is the so-called Strekenitz canal, begun in 1390 and completed in 1398. It is one of the oldest in Europe, and connects the river Elbe with the Trave, uniting with the former just above Lauenburg, and with the latter above Lubeck. The second artificial water communication is known under the name of the Schleswich-Holstein, or Eyder Canal, and may be found on any good map.

THE PROPOSED LINE.

This has been submitted to the world in the form of an anonymously published pamphlet, entitled, "The Cutting of of the Isthmus of Holstein between the Baltic and the North Sea." Lubeck is proposed as the eastern terminus of this route, while it is thought that the most feasible point for the western terminus would be Gluckstadt upon the Elbe. This line, as shown by accurate and reliable surveys, would require no locks. It is proposed to follow the river Trave from Lubeck to a point where it approaches the Hemmelsdorf Lake. This lake belongs to the most remarkable water reservoirs of the Baltic countries; originally an inlet, as most of the other lakes of the Baltic, it is now separated from the sea by a narrow strip of maritime deposits. Hills of about one hundred feet in hight protect it against all winds in such a manner that Napoleon I. designated it for a winter harbor for his Baltic fleet, when, by the catastrophe of 1813, the whole project fell into oblivion. Moreover, this natural harbor is situated in the midst of one of the most populous, prosperous, and best cultivated districts; it is surrounded by a circle of charming villages, and only awaits the completion of the projected canal to become an excellent seaport. The length of the section from this lake to Gluckstadt is forty-eight miles; adding thereto the distances through the lake and from Lubeck to the Baltic, we have a total length of fifty-three miles, or over half the length of the Suez Canal. The cost of the execution of this work, including the construction of harbors at Gluckstadt and Lubeck, has been estimated at $23,720,930, in gold.

Should a work of this kind be executed, a yearly passage of from twenty to thirty thousand vessels through the canal might safely be predicted. Such a strait would open to the ocean the immense territory in Russia; and, besides this, the Prussian coast, which is over half the length of that of France would be made directly accessible to the open sea.

Taken all in all, the cutting of the isthmus of Holstein may safely be contrasted with that of Suez. In shortening an old way of traffic it will contribute of transforming the slow march of civilization in the northern European countries into one worthy of this century of steam.

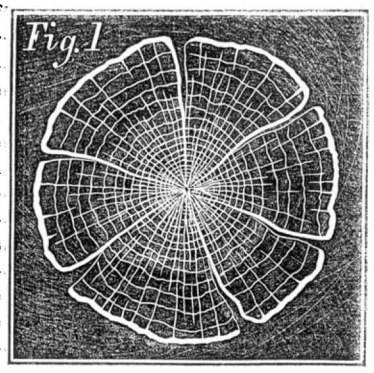
THE CONTRACTION OR SHRINKING OF TIMBER.

In a lecture delivered by John Anderson, C. E., at the "Society of Arts" in London, some information was given on the contraction of timber which we deem of sufficient interest to reproduce from *The Builder*, together with the diagrams illustrative of the subject.

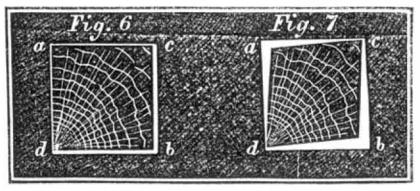
The lecturer, after some introductory remarks proceeded as follows:

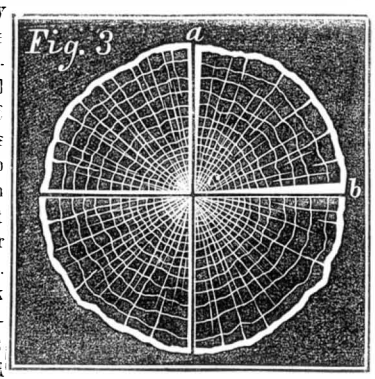
The wretched state of the floors, doors, and shutters in many of the London houses too plainly gives ample and complete evidence of persistent disobedience to the natural law of shrinkage, and the only hopeful consolation is that we do not go unpunished, as the penalty inflicted in time may lead to improvement.

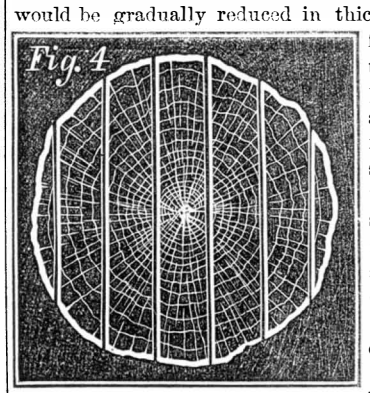
An examination of the end section of any exogenous tree, such as the beech or oak will show the general arrangement of its structure. It consists of a mass of longitudinal fibrous tubes, arranged in irregular circles that are bound together by means of radial strings or shoots, which have been variously named; they are the "silver grains" of the carpenter, or the "medullary rays" of the botanist, and are in reality, the same as end wood, and have to be considered as such, just as much as the longitudinal woody fiber, in order to understand its action. From this it will be seen that the lateral contraction or collapsing of the longitudinal, porous, or tubular part of the structure, cannot take place without first crushing the medullary rays, hence the effect of the shrinking finds relief by splitting in another direction, namely in radial lines from the center, parallel with the medullary rays, thereby enabling the tree to maintain its full diameter, as shown in Fig. 1.

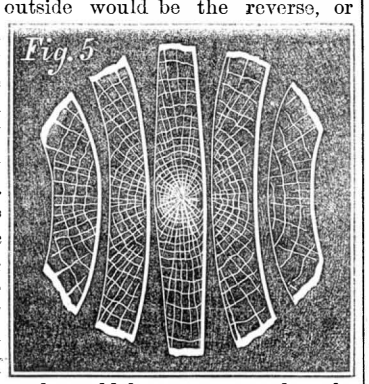


If the entire mass of tubular fiber composing the tree were to contract bodily, then the medullary rays would of necessity have to be crushed in the radial direction to enable it to take place, and the timber would thus be as much injured in proportion as would be the case in crushing the wood in the longitudinal direction. If such an oak or beech tree is cut into four quarters, by passing the saw twice through the center at right angles, before the contracting and splitting have commenced, the lines *a c*, and *c b*, in Fig. 2 would be of the same length, and at right angles to each other, or, in the technical language of the workshop, they would be square; but, after being stored in a dry place, say for a year, it would then be seen that a great change had taken place both in the form and in some of the dimensions; the lines *c a*, *c b*, would be the same length as before, but it would have contracted from *a* to *b* very considerably, and the two lines *c a*, and *c b*, would not be at right angles to each other by the portion here shown in white in Fig. 3. The medullary rays are thus brought closer by the collapsing of the vertical fiber. But, supposing that six parallel saw cuts are passed through the tree so as to form it into seven planks, as shown in Fig. 4, let us see what would be the behavior of the several planks. Take the center plank first. After due seasoning and contracting, it would then be found that the middle of the board would still retain the original thickness, from the resistance of the medullary rays, while it would be gradually reduced in thickness toward the edges for want of support, and the entire breadth of the plank would be the same as it was at first, for the foregoing reasons, and as shown in Fig. 5. Then, taking the planks at each side of the center, by the same law their change and behavior would be quite different; they would still retain their original thickness at the center, but would be a little reduced on each edge throughout, but the side next to the heart of the tree would be pulled round or partly cylindrical, while the outside would be the reverse, or hollow, and the plank would be considerably narrower throughout its entire length, more especially on the face of the hollow side, all due to the want of support. Selecting the next two planks, they would be found to have lost none of their thickness at the center, and very little of their thickness at the edges, but very much of their breadth as planks, and would be curved round on the heart side and made hollow on the outside. Supposing some of these planks to be cut up into squares when in the green state, the shape that these squares would assume, after a period of seasoning, would entirely depend on the part of the tree to which they belonged; the greatest alteration would be parallel with the medullary rays. Thus if the square was near the outside, the effect would be as shown in Fig. 6,

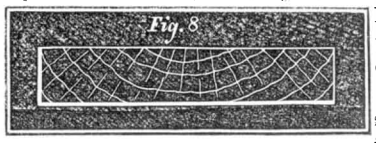




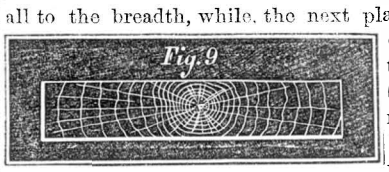




namely, to contract in the direction from *a* to *b*, and after a year or two it would be thus, as seen in Fig. 7, the distance between *c* and *a* being nearly the same as they were before, but the other two are brought by the amount of their contraction closer together. By understanding this natural law, it is comparatively easy to know the future behavior of a board or plank by carefully examining the end of the wood, in order to ascertain the part of the log from which it has been cut, as the angle of the ring growths and the medullary rays will show thus, as in Fig. 8.



If a plank has this appearance, it will evidently show to have been cut from the outside, and for many years it will gradually shrink all to the breadth, while the next plank, shown in Fig. 9,



clearly points close to the center or heart of the tree, where it will not shrink to the breadth but to a varying thickness, with the full dimensions in the middle, but tapering to the edges, and the planks on the right and left will give a mean, but with the center sides curved round, and the outside still more hollow.

The foregoing remarks apply more especially to the stronger exogenous woods, such as beech, oak, and the stronger home firs. The softer woods, such as yellow pine, are governed by the same law, but in virtue of their softness another law comes into force, which to some degree affects their behavior, as the contracting power of the tubular wood has sufficient strength to crush the softer medullary rays to some extent, and hence the primary law is so far modified. But even with the softer woods, such as are commonly used in the construction of houses, if the law is carefully obeyed, the greater part of the shrinking, which we are all too familiar with, would be obviated, as the following anecdote will serve to show: It was resolved to build four houses, all of the best class, but one of the four to be pre-eminently good, as the future residence of the proprietor. The timber was purchased for the entire lot, and the best portions were selected for house No. 1, but by one who did not know the law, and to make certain of success this portion of the wood had an extra twelve months' seasoning after it was cut up. The remainder of the wood was then handed over to a contractor for the other three houses, who han an intelligent young foreman, who knew the structure of wood as well as how to obey the law, and who, therefore had the wood for the three houses cut up in accordance therewith. The fourth house was built the following year by another man; but long before ten years had passed to the great surprise and annoyance of the proprietor, it was found that his extra good house, No. 1, had gone in the usual manner, while the other three houses were without a shrinkage from top to bottom. As Solomon says, "Wisdom is profitable to direct."

A similar want of correct knowledge of the natural figure and properties of the structure of wood, such as the oak, is constantly shown by the imperfect painting to resemble that wood, as exhibited on the doors and shutters of many of the houses of this metropolis. If we cannot afford to have genuine wainscot doors, as in France, but yet desire to have an imitation, it would surely be worth the trouble to have a block cut from the quarter of an oak tree, and to have each of its six sides planed and polished, in order to make plain their several features. The house painter would then see what nature really is, and thus save us from the ridicule of other nations, when we mix up "silver grains" and all the other natural features upon one side of a board or panel.

On Cotton-seed Oil, and its Detection when mixed with other Oils.

Mr. Reynolds believes that nearly the whole of cotton-seed oil is used in the sophistication of oils of older repute. The probability that the supply will now continue and increase is especially indicated by a consideration of the source of the oil. The weight of seed yielded by each cotton plant is about three times as great as the cotton obtained from it, and up to the present time nearly the whole of this seed has been wasted, or returned to the soil as a fertilizer. The present price of the refined oil is less than three shillings per gallon, and, considering the large porportion of seed that has yet to be utilized, it is probable that it will long continue to be the cheapest fixed oil in the market. Hence the desirability of our giving some attention to a substance which is pretty sure to present itself to us in our daily avocations in some shape or other.

After describing the methods of preparing and purifying cotton-seed oil, Mr. Reynolds adds some remarks upon the detection of this oil when mixed with olive oil. A well-known chemist, whom he regarded as the highest authority upon the subject of the adulteration of oils, told him that he did not know of a test for this purpose.

The experiments which he made induced him to regard the

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nitrate of mercury test as affording sufficiently clear reactions to enable him to find this oil when mixed with olive oil.

He used Pontet's test as follows: 6 parts of mercury are dissolved in 7½ parts, by weight, of nitric acid, 1·36 without the application of heat, and form the test solution. The tubes for making these experiments are merely strong test tubes of 7 inches in length, and holding about a fluid ounce. They are roughly graduated by pouring in 30 minims of water and scratching a line upon the glass; another line is made at the point reached when a total of 6 drachms of water have been poured in. The lower line is marked "test," the upper one "oil." Pour in first the test to its mark, and fill up with the suspected oil to the other line; shake well and set aside, shaking again about an hour afterwards. In from three to twelve hours, according to the temperature. etc., a genuine olive oil will have solidified entirely, the product after the latter interval being quite hard when touched by a glass rod. Cotton-seed oil, when similarly treated, will not solidify, but remains fluid. A mixture of 25 parts of cotton-seed oil with 75 parts of olive oil gives an intermediate condition. The contents of the tube become solid, but if a little be taken out with a glass rod, it is found to be soft, pasty, and without any friable character. On the other hand, when pure olive oil is so treated, the product is hard, friable, and not pasty. Comparative trials should always be made, and caution exercised in accepting the apparent conclusions. Where only 12½ per cent of cotton-seed oil is present, the reactions are not so distinct as with 25 per cent., but Mr. Reynolds considers them usually sufficient to decide the case.—*Druggists' Circular.*

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Black Ash—Mond's Process for Obtaining Sulphur.—I propose giving a tolerably full account of Mond's process, as described by himself, in using the waste from the black-ash generally employed in England, and which allows of more rapid operation than the more compact waste of most continental works.

In place of the set of four vats generally in use for lixiviating black-ash, he employs a set of ten or twelve. All of these are connected by pipes in the usual way, so that the soda liquor runs from the bottom of one vat to the top of the next one, and by special pipes and taps which allow the sulphur liquor to run out of the bottom of each vat to the top of any other vat in the set. Besides this, they are provided with extra taps and shoots to convey the sulphur liquor to wells or settlers. The lower parts of all the vats are connected with a fan (capable of producing a pressure of about seven inches of water), by pipes furnished with dampers, which regulate the quantity of air passing through.

A noiseless fan of Schiele's construction twenty inches in diameter, price $50, propels a sufficient quantity of air for the treatment of the waste resulting from 100 tuns of salt cake per week. Four of the vats are always filled with black-ash in the course of lixiviation; the other six or eight with waste to be treated according to the invention. As soon as the black-ash is completely spent, and the weak liquor is well drained off, the connection with the fan is opened. The waste soon begins to heat, the temperature gradually rising above 200° Fah., and gives off quantities of steam, becoming greenish, and afterward yellow on top, gets more and more dry, and would take fire if the air was passed through long enough. The time for discontinuing the passing of air, so as to have the best results, must be ascertained in each establishment by experiments, and varies according as much or little hyposulphite in the hydrosulphide and bisulphide of calcium are formed, which are afterward oxidized into hyposulphite. A part of the hyposulphite is again decomposed into sulphur and sulphite, which is very insoluble, and cannot be extracted by lixiviation. Carrying the oxidation too far would therefore entail a serious loss. On an average the time of exposure will be limited to between twelve and twenty-four hours. The waste is now lixiviated systematically with cold water, the weaker liquors passing from one vat to the next one in course of lixiviation, so as to obtain only strong liquors, which operation can be easily performed in six to eight hours. When this lixiviation is finished, air is again passed through the waste in exactly the same way as before; the waste is again lixiviated, and the same treatment is repeated a third time. The vat is then ready to be cast, and is again filled with black-ash. When the operations have been well conducted, sulphur equal to about 12 per cent of the weight of the salt cakes used in making black-ash is obtained in solution from the waste. The waste contains only traces of sulphide of calcium, and is principally composed of carbonate of lime, sulphite, and sulphate of lime, which, far from being noxious, make the waste, on the contrary, a valuable manure. In separating the sulphur from the liquors thus obtained, by adding muriatic acid, I met with much more difficulty than I had anticipated from such a reaction.

The oxidation of the waste is regulated so as to obtain a liquor, which contains as nearly as possible to every equivalent of hyposulphite two equivalents of sulphide. This liquor is decomposed by first adding to a certain small quantity of acid an excess of liquor, until there is a trace of sulphide in the mixture; then a quantity of acid sufficient to neutralize the whole of the calcium is poured in; a new quantity of liquor equivalent to this last quantity of acid is added, and then acid again and liquor again, and so on until the vessel is nearly filled. To the last liquor only one half of the required acid is added, and steam introduced until the liquid shows a temperature of about 140° Fah. Practically speaking, the liquor and acid are poured at the same time into the decomposing vessel in nearly equivalent proportions, the workmen taking care to keep a small excess of liquor up to the end of the operation. This part of the process is carried on in covered wooden tanks connected with a chimney in order to carry off any sulphureted hydrogen which may be evolved by mistake of the workmen. If properly carried out there should be, however, no appreciable quantity of that gas evolved.

The practical result of this mode of working is simply precipitation of nearly the whole of the sulphur in a pure state.

$$Ca\,O,\,S_2\,O_2 + Ca\,S_x + 3\,H\,Cl = 3\,Ca\,Cl + 3\,H\,O + (2+x)\,S.$$

The details of the reaction are, however, very complicated, almost all the different acids of sulphur being probably formed during the process.

In practice, about 90 per cent of the muriatic acid, calculated according to the above-described method, is required to thus effect the complete decomposition of a well-proportioned liquor. If it contains more hyposulphite than above indicated, less acid is, of course, to be used. About 90 per cent of the sulphur contained in the liquor is precipitated in an almost pure state, and settles exceedingly well within two hours. The supernatant clear solution of chloride of calcium is then drawn off, and another operation directly commenced in the same vessel as soon as a sufficient quantity of sulphur is collected in it, which will depend on the size of the vessel and on the strength of the liquor, ranging from 4 per cent to 7 per cent of sulphur; it is drawn out by means of a door at the lower part of the vessel into a wooden tank with a double floor, where the chloride of calcium is washed out by water, and the sulphur is then simply melted down in an iron pot. The product thus obtained contains only from one tenth of one per cent to one per cent of impurities, and is thus by far superior to any sort of brimstone in the market, though it has sometimes a rather darker color, caused by traces of sulphide of iron, or a little coal dust, which latter may have been suspended in the muriatic acid.

The total yield of sulphur obtained by the process amounts thus to 10 or 11 per cent of the weight of the salt cake used in making black-ash, or to about one half of the sulphur therein contained, and to about 60 per cent of the sulphur contained in the waste. It is still hoped, however, to considerably increase this quantity after some more years of experience.

The cost of production is inconsiderable. In the different continental and English works, where the process has now been working for years, the expense for wages, fuel, and maintenance amounts only to $5 per tun of sulphur, and the outlay for the apparatus will be more than covered by the net profits of the first year. An establishment making three tuns can save at least $2,000.

(To be continued.)

For the Scientific American.

THE RELATION OF MECHANISM TO ART.

[BY W. L. ORMSBY, JR.]

The facility for duplication produced by mechanical processes has aided signally in the perpetuation of artistic productions. In the single department of casting, the varieties of artistic forms that are multiplied become illimitable. The commonest articles of domestic use, with the aid of mechanism are embellished by the *perpetuation* of the work of artists. Even so ordinary an object as a parlor stove is now decorated with scrolls and flowers and other devices not unworthy the chisel of a sculptor. The application of the same principle of casting gives us beautiful ornaments in gas fixtures, chandeliers, picture frames, cornices, type, and a million other devices of the plastic art.

Likewise the wonderful improvements in printing have perpetuated the achievements of the draftsman and engraver, until the cheapest book is incomplete without its complement of artistic illustrations.

In articles of dress, too, the combination of mechanism and art is peculiarly striking; see the exquisite texture and patterns of brocades, of embroideries, of laces, and even of the cheaper goods. How beautifully is the universal taste for regular forms ministered to, while in even the cheapest calicoes are seen some productions of great artistic skill.

Take the single article of carpets, of all the varied products of the loom, and we find that in the combination of colors, the delineation of objects, the art of the painter is often fairly rivaled. The cheapness of duplication by mechanical means is also an essential requisite for its success in multiplying artistic forms. Take, for instance, paper hangings—the finest of which are almost undistinguishable from fresco painting—a day-laborer can paper the walls of his dwelling almost as cheaply as he can whitewash them.

The difficult and expensive art of engraving affords one of the most striking illustrations of the point in question. Few persons are aware of the immense expenditure of time and money and artistic ability that are necessary to produce an ordinary bank note or a common stamp. The elegance that marks them would be absolutely unattainable without the wonderful mechanism through which an expense of a hundred thousand dollars is made available on each two cent letter stamp.

Nor should we overlook in this connection the beautiful shapes that are furnished by such absolute mechanism as the turning lathe. The ornamentation of bank notes, of the backs of watches, of furniture, machinery, and tools, by the simple operations of the lathe are familiar examples.

And now, in obedience to a great law, and following in the train of mechanical triumphs comes chromo lithography, perpetuating the skill of the painter as printing has perpetuated the skill of the engraver.

The whole subject is suggestive of the correlation of the arts. Just as individuals cannot improve without improving the nation, so one art or science cannot advance without carrying the sister arts and sciences in its train. The triumph of mechanism has been the perpetuation of art.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The California Fairs.

MESSRS. EDITORS:—While waiting to keep an engagement in this *Fair* building of the Mechanics' Institute of San Francisco, I am reminded that your readers might be pleased to see even a hasty sketch of the two California Fairs—the State Fair at Sacramento recently closed, and this one at San Francisco, recently opened.

Of the State Fair at Sacramento I cannot say too little; while of this one I can scarce say enough, in the little space at your disposal for such a purpose. To say that the State Fair, so much and so loudly heralded, was a disgrace to California, and would have been unworthy as an exhibition of the industry and productions of any fourth-rate county within her borders, is to speak a simple truth.

The one thing which seems to have engrossed the faculties of the managers, was the half-mile race course. The entire machinery department consisted of a boiler, engine, and shafting—all the requisites for machines in motion, without a single machine of any kind to be thus exhibited; a part of the space set apart for this purpose was used for the display of a slim collection of agricultural implements.

Pleasanter far is the duty of calling attention to this Fair of the Mechanics' Institute, held in a building some 250 by 150 feet, provided with double galleries on each side of the nave (which is not far from 75 feet wide and 50 feet high) constructed for the purpose, and well filled in every part with articles of use and novelty.

The central feature of the main exhibition room is an oval shaped fountain, around which, and freshened by the ceaseless play of the waters, the most tempting fruits are displayed—fruits of all seasons and of almost every clime. Beans and blackberries, apples and apricots, grapes and lemons, melons and oranges, pears and pomegranates, peaches and pumpkins, plums and potatoes, peppers and quinces, strawberries and squashes. Turnips and vegetables, of every kind, are exhibited in great profusion, while pilfering fingers are restrained by the intervention of coarse wire nettings. Flowers and plants, too, of number and variety uncounted, are assigned places in the immediate vicinity; and behind them again are stands, where new cider is made, which, with California Vichy water, slakes thirst for the thirsty.

The general effect of the decorations of the room is excellent. Indeed the exhibition of taste in the arrangement of draperies and in the classification of articles is well worthy the attention of our American Institute managers. Without attempting to particularize, I will content myself with a partial enumeration of articles which attract my attention as especially novel or useful. Not the least of these is the Patent Agency—where a variety of quaint models appear, and behind them two specimens of printing presses, one a power and the other a hand press. On the latter is being printed a facsimile of Ben Franklin's first newspaper, copies of which are in very good demand at a dime each.

A suspension bridge connects the galleries near the fountain, and enlightens the otherwise ignorant as to the modes of making and using wire cables for such purposes. The bridge is the joy of all juvenile and many senile visitors.

Did you never think of the advantages of windows without weights? Here is Sullelt's ball window catch which holds either upper or lower sash at the precise point desired—a more simple and effective appliance for the purpose than I have heretofore seen.

Dreamed you never of an endless band saw for scroll as well as heavy work? Many a time have I, and my dream here has substantial shape in the contrivance of Otis Jackson. The wheels upon which the saw moves are about five feet diameter, made of iron, tired with leather; and the ends of the saw are skillfully brazed together, forming, substantially, an endless belt. Have you broken your back at your father's wood pile? Then you *would* look with pleasure on Noel's application of crank power to a common buck-saw, worked in connection with a common buck for the wood.

And if the pump were as absolute a necessity in New York as it is in California, your eyes would sparkle at sight of Atwood & Bodwell's self-regulating wind-mill for operating it, and also at that of the Gerrish submerged force pump as a substitute for the usual style of the article.

Had you plowing to do, and California soils in place of the stony hardnesses of New England, you would debate less upon the instrument itself than upon the ease of the seat. The several gang plows in use here do their work well, and all of them provide a comfortable seat for the driver, while the work goes on. Nearly a dozen different specimens of gang plows, the work of as many different makers, are here on exhibition. They consist of two plows managed in connection with a two-wheeled vehicle on which the driver rides.

If the construction of water and sewer pipes required your consideration, you would doubtless respect the asphaltolin pipes, and wonder why the same material might not be applied to tunnels of large caliber.

A blower on Root's plan, built at the Globe Works, Stock-

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ton, would not seem wonderful, because you will find a larger instrument in your city.

Enough, however, of machinery, and almost enough of the Fair. Let us enter only, before we leave, this large room built and lined with the different kinds of wood which grow in California. The wood riches of all the earth are seemingly gathered here, so many are the kinds and so well polished the specimens. Strahle & Hughes, who exhibit, call it the "Laurel Palace," and a palace it certainly is—worthy the Fair and worthy the State. B.

San Francisco, Sept. 27, 1869.

On the Assimilation of Inorganic Substances in the Animal Economy.

MESSRS. EDITORS:—The idea that inorganic substances are not assimilated in the animal organism, advanced by a correspondent, pages 166 and 230, current volume, is a favorite theory of the so-called vegetable or Indian doctors, to which class his authority, Dr. Bellows, appears to belong. The theory in question is founded on the obscure notion that some mysterious change takes place when an inorganic compound is absorbed in a vegetable, that it is vitalized, and that only vitalized compounds can be appropriated by living animals. Unfortunately this theory is not borne out by the facts; the very contrary is true. It might, with some slight chance of success have been defended many years ago, when the sciences of synthetic organic chemistry and biology were yet unborn; but since we have learned to compose many so-called organic compounds, for instance, alcohol, gum, sugar, etc., and even urea and several other animal substances, out of their constituent elements—without the aid of living organisms—and that these thus artificially manufactured substances are perfectly identical, to all intents and purposes, to those derived from the usual organic channels, and act on the animal system in the same manner, the doctrine of the so-called "vitalism" is exploded.

We know now, also, that there is no difference whatever between phosphates, sulphates chlorides, etc., if made by art or derived from vegetable sources, so that, for instance, the phosphate of lime or soda, naturally found in the bran of flour is not in the least different from any other compound of that name, from whatever source it be derived, provided it be pure.

In regard to the main point, the absorption and assimilation of inorganic matter, in the animal body; this is a so well established fact as to make the contrary assertion almost unworthy of contradiction. Water is certainly an inorganic compound, and this is so largely assimilated that the great portion of the bodies of all animals consists of water; the salts contained in the divers mineral waters, are so thoroughly assimilated as to cause changes in the constitution of the individuals using them, even the external applications in the shape of sulphur and other baths, have similar effects; and lead, mercury, arsenic, etc., either externally or internally, are so thoroughly assimilated as to cause painters' colic, the mirror-makers' paralysis, and the finding of arsenic in the very bones of the subject. In such cases the antidotes must also be assimilated in order to find the poisons and perfect a cure.

It may be asserted that these cases must not be called assimilation, and are only an absorption, because such substances do not belong in the living organism; by the following facts, however, I will prove that if substances belonging to the organism are absorbed in the same manner, they finally perform all the functions of assimilated ingredients.

The cause of chlorosis is that the digestive apparatus is unable to absorb the small amount of iron present in many kinds of food. Now experience has taught, in general, that if certain necessary substances are not absorbed, all that we have to do is to present these very substances in large quantities, and that finally the system will be compelled to absorb them. So in chlorosis, iron is administered with the food, either as a metallic powder, an oxide, or as a chalybeate mineral water; if inactive, the dose is simply increased, and finally in some cases the disease is only overcome, by giving extraordinary large doses, which compel the system more forcibly to absorption. If once absorbed the difficulty is overcome, assimilation follows at once. Recent investigations have shown that a small quantity of manganese is always present in the blood with the iron, and as the iron administered is always chemically pure, it was suggested that some cases of failure in the iron treatment might be due to the absence of the necessary manganese. The idea was at once acted upon, and now, in case of non-success of the iron treatment, all physicians who are posted up in regard to the progress of their art, add a small quantity of manganese or a suitable manganese compound to the iron, and always with perfect success. The iron and manganese pills, or quinine and manganese pills, have, in fact, become a standard prescription.

If any one still doubts assimilation of inorganic substances by the blood, let him try to take phosphate of iron daily. Many individuals will soon find that their blood becomes so rich under this treatment that it shows itself in pimples over the face and elsewhere. Many potash compounds have the same effect.

The above will suffice, I believe, to settle the point in question, and I will only add that the assimilation of inorganic compounds seems highly probable, if not proved, by the following facts: The rapid cure of sore gums by internal use of chlorate of potash; the prevention of morbid profuse perspiration by the internal use of mineral acids; the cure of epilepsy by sulphate of zinc; the blue coloring of the skin by internal use of nitrate of silver; the sedative effect of bromide of potassium; the resultant brittleness of the bones by the prolonged use of iodides; the nourishing effect of lime water, if added to milk or certain other kinds of food.

P. H. VANDER WEYDE, M. D.

Tyndall's Theory of Comets.

MESSRS. EDITORS:—In your notice of the ingenious theory of Dr. Tyndall (p. 219), in relation to comets, I find a corroboration of a belief of my own that "all space is filled with imponderable matter except the small part occupied by the planets—which are themselves pervaded by the same—and that this ungravitating matter is the medium for the action of the imponderable agents, electricity, magnetism, etc., which agents are the manifestation of different elements of that matter."

The nucleus of a comet is no doubt ponderable, as it observes the laws of gravitation, but is so rare and transparent that it obstructs only the calorific rays, while the actinic, passing through, precipitate the imponderable matter of space, rendering it visible, the same as they precipitate invisible vapor of water or other matter, this being again dissipated as soon as the shadow is removed.

If the nucleus were an opaque body the shadow would be a cone, unlike a comet's tail, but being transparent the rays passing through are more or less refracted and reflected, causing this pseudo-penumbra to assume various shapes, according to the nature of the interruption or the varying direction of the deflection.

May not the "luminous envelopes" which surround the nucleus, and which you say are not accounted for by his theory, be, on the other hand, a corroboration of it; if it is admitted that the sun's actinic rays may be reflected from the surface of the nucleus, or from surfaces within it, into the spaces immediately around it, with even greater power than have those which pass through with but little refraction? This theory, if correct, makes of the sun almost a creator, realizing the dreams of the magi.

As the "vortical" theory of Laplace and Herschel, if true, demonstrates that there was a *time* when creation commenced, and therefore a power which instituted at that time a new sun, so I do not despair of our yet finding out the way in which it was done. Because we know that gravitation was infused into some matter, it does not follow that all matter is subject to it. CHARLES BOYNTON.

How to Kill the Fleas and the Dog.

MESSRS. EDITORS:—Your correspondent, G. W. B., on page 230 of the present volume, says that "a mixture of carbolic acid with water—one fourth acid, three fourths water—put on a dog will kill fleas at once." There is a somewhat important omission here—it will kill the dog also.

Your correspondent undoubtedly means one fourth of the *saturated aqueous solution* of carbolic acid, three fourths water. Carbolic acid is a crystalline substance (chemically an alcohol rather than an acid), which is soluble only to the extent of 5 per cent in water. A solution for the purpose of killing parasites on animals should contain little more than 1 per cent of carbolic acid to 99 per cent of water.

There is a very dangerous concentrated fluid carbolic acid in the market, consisting often of 90 per cent of the pure acid, dissolved in some of the hydrocarbons associated with it in the process of manufacture. I have purchased this of a druggist of the highest reputation in the city of New York under the name of "solution of carbolic acid," and have suffered accidentally in consequence from its cauterizing effects. I have been cognizant also of several serious accidents from confounding this concentrated fluid with the *saturated aqueous solution* of carbolic acid, which is perfectly safe and strong enough for all applications, except surgical, to the living subject.

It is important that some nomenclature should be agreed upon, and rigidly adhered to, to distinguish these preparations. Otherwise, in the extended use of carbolic acid, fatal accidents will be liable to occur.

WM. F. CHANNING, M. D.

Providence, R. I.

Demuth's Improvement in Glass Window Lights.

MESSRS. EDITORS:—I call your attention to an error in your notice of Demuth's Glass Window-lights, published in your edition of October 16. You state that the illuminating power of the light transmitted through the rods is not materially impaired, whereas it is not only not impaired but on the contrary materially increased, or at least concentrated to such a degree that the back part of an apartment will become nearly as light as the front containing the lights. The refracting power of the rods, which like so many lenses collect the radiating rays into a parallel beam, produces this effect, which can never be obtained by flat panes, and which, with rods of different tints, is exceedingly beautiful.

By publishing the above correction you will oblige

New York city. VICTOR E. MAUGER.

Fresh Water at the Seaside.

MESSRS. EDITORS:—Through the constantly shifting sands of Cape Cod, sixteen to twenty feet from high water and not more than three feet above it, is sunk an iron tube to a depth of fifteen feet, at which point is found fresh water of the sweetest quality and in inexhaustible quantity, which rises and falls in the tube regularly with the tide of its near neighbor the Atlantic ocean.

Yet though more than one hundred barrels have been pumped from it at one time, not the slightest trace of saline matter has been found to mar the freshness of its taste. Of such fine quality is it that vessels supply themselves for a sea voyage from this well.

I think the above facts may prove themselves a curiosity to others as well as myself, and that you will be able to give an explanation of the phenomenon through your columns.

North Brookfield, Mass. JOHN Q. ADAMS.

Glass Manufacture in the United States.

MESSRS. EDITORS:—Some singular statements get into newspapers sometimes. Here is one copied from the Boston *Commercial Bulletin* of Sept. 11, that for accuracy is not much to be depended upon. Under "Pittsburgh Items" it says, "In June last, Redick & Co. began the manufacture of extra annealed flint glass lamp chimneys—they are the only manufacturers who anneal their chimneys—which process renders them strong and clear."

It is most assuredly the first time that the wonderful revelation has been made that glass is rendered clear by annealing, and the *savans* who have made researches upon this subject have been sadly in the dark if we are to believe Messrs. Redick & Co. Yet Réaumur, Dartigues, Dumas, Bontemps, and others, all agree that glass slowly cooled (annealed) may be devitrified, that is to say, that in cooling glass slowly, the elements arrange themselves in such a manner as to form a certain refined crystalline silicate, which separates from the remaining mass and produces thereby a milky and rough grained glass.

If the object of publishing such a statement is to sell the wares, it is a poor kind of a puff; and instead of recommending the goods it advertises the ignorance of the manufacturers.

While on this subject of glass, let me say a word in regard to the comparative degree of efficiency between European and the American manufactories. It is universally conceded, that although we have vastly progressed in this country, especially in pressed glass ware, we are still sadly behind hand in many branches. It is true we are making a very fair article of plain window glass, but have we yet made any colored window glass? Can we compete with the French, the English, for fine cut glass? Can we imitate or excel the Bohemian in fancy colored glass? Can we rival with the French, English, and Belgian manufacturers in making plate glass? Do we generally produce as fine an article of glass as the French and Bohemians do? Have we ever applied etching to glass as it is now so extensively done in France, or have we yet made any trials in applying photography to ornamenting glass? With the exception of one or two cases, have we used the Siemens furnaces with as much success as they have in Europe? Can we imitate the artistic *chefs d'œuvre* of production that are to be seen in Europe in the chandelier and fountain line? Do we gild and paint glass like the French and Bohemians? Can we generally produce those marvelous articles blown by the French, so thin, so brilliant, and so regular in workmanship?

To the above and to many other questions I fear we must give a negative answer. The aim of most of our glsss manufacturers has been to improve simply in pressed wares; a very worthy object it is true, yet it is well known that pressed glass can never attain the perfection of blown and cut wares. An inexperienced person will soon be able to distinguish one from the other, and there is a limit beyond which improvements in pressed wares can not go. Improvements in presses have been made to render them easy to work and to adapt them to different sizes of molds. Molds have been made with combinations to mold all sorts of shapes. Some have been quite successful, but for all that, all pressed glass bears its stamp and can not be compared to blown and cut glass. Is is not time then for some of our glass manufacturers to devote their time and intelligence to other purposes? With the exception of one or two Eastern manufacturers, we have but little or no colored glass made in this country. Where is the fault? It cannot be the cost for we have plenty of materials and at reasonable prices. I fear it is not this but the want of the skillful labor they have in Europe. It is a crying shame that we should send to Europe for all the plate glass we use, and we use a large quantity of it, while we have everything in profusion in this conntry to make glass. Attempts have been made in this country to make plate glass but so far have been unsuccessful. Another attempt is now being made at New Albany, Indiana, according to a communication printed lately in the SCIENTIFIC AMERICAN. Let us hope that this, like the others, will not be a failure, but I think I can say, almost positively, that the non-success of these enterprises is not due to disadvantages in materials, but is attributable to an over-confidence and self-reliability in the knowledge of those who undertook it without having skilled and experienced hands to help them. Mr. Lockwoode, in the communication above referred to, says, that "there is no such word as fail in the dictionary" of the gentleman at New Albany. Let us hope that he may not be called to print it.

Washington, D. C. C. COLNE.

Testing Boilers.

MESSRS. EDITORS:—Sometime since a correspondent suggested a boiler test, to be tried at the present Fair of the American Institute. It consisted in connecting the boilers to be tested to a 40-horse power engine, arranged to drive an immersed screw propeller; the boiler which would produce the greatest number of revolutions of the propeller with a given amount of coal, to be adjudged the "champion boiler."

There would, doubtless, be some fallacies involved in a test of this kind. The power required to put a propeller in motion is dependent, to a great extent, upon the velocity with which it revolves, varying nearly as the square of the velocity. For example, it would require one hundred times the power, per revolution, to communicate one hundred revolutions per minute to the propeller, that it would take to communicate ten. Consequently, if the proposed test were put in practice, the "champion boiler" would be the one which fired slowest and ran the propeller at the lowest velocity. F. G. FOWLER.

Bridgeport, Conn,

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Improvement in Farm Gates.

Nothing is more unsightly around a farmer's house than a dilapidated farm gate. Many improvements have been patented, but the one illustrated herewith is among the latest. As these modern gates have been adopted by farmers a vast improvement in the appearance of country homes is apparent. The gate shown in the annexed engraving is claimed to possess advantages not to be found in any other in use.

Fig. 1 shows this gate partially opened; and Fig. 2 shows it entirely opened, and held from closing by a latch. In Fig. 1, if the gate should be slid to the left it would meet the post, A, and the latch, B, engaging with the post would fasten it shut. When partially opened, the gate rests on a block, C, at the middle of the bottom, with a notch at the top to admit the bottom rail of the gate, the first motion in opening being a sliding to the right.

It has a wooden hinge bar, D, composed of two pieces of timber playing on each side of the gate, with a gudgeon or hinge pin, E, at the top and a similar one at the bottom. This hinge bar stands at the angle shown in Fig. 1, when the gate is closed, and remains in that position until the middle vertical bar of the gate meets it as the gate is slid open.

A roller, F, between the two parts of the hinge post, D, allows the gate to be slid back to the position show in Fig. 1 without disturbing the position of D. A cord running from the post, G, to the top of D, limits the inclination of the latter.

In opening the gate after it has reached the position shown in Fig. 1, it engages with the hinge post, D, the bottom of which is held by, and plays in a step H. The hinge post is then thrown back to a vertical position, lifting and carrying the gate with it until the gudgeon, E, enters a slotted bearing, I, nailed on to the tops of the posts G and I. These posts are not set one directly in front of the other, but one a little to one side of the other to allow the gate to swing between them.

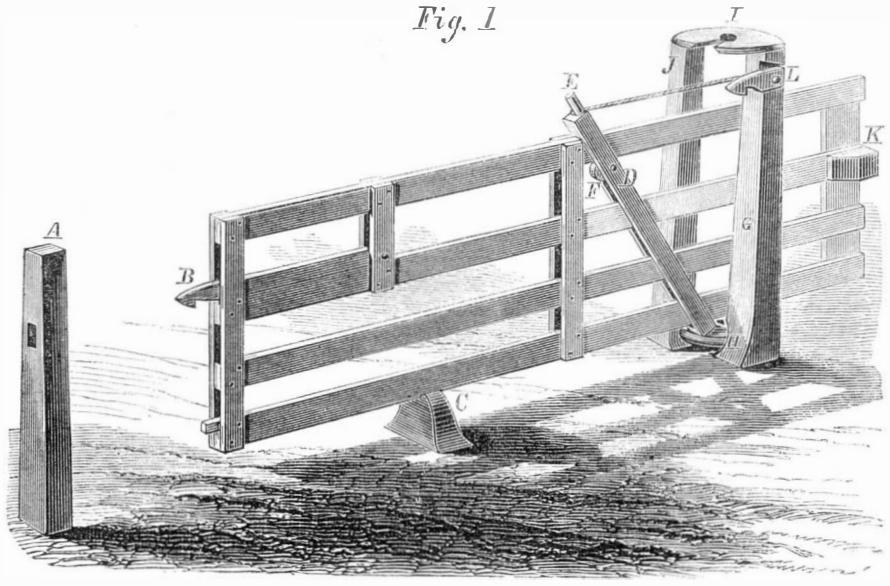
As soon as the hinge post, D, reaches the vertical position the gate is balanced on its center of gravity, and may be rotated upon D until it reaches the position shown in Fig. 2, in which it is held by the latch L.

Fig. 2 shows by the dotted lines the first position of the gate and also exhibits the positions of the different parts when the gate is fully opened.

The hinge post, D, may be made of a proper length to elevate the gate above snow in winter, and the gate may be unhung as readily as gates with the common hinges. Nothing but wood and common nails are employed in its construction.

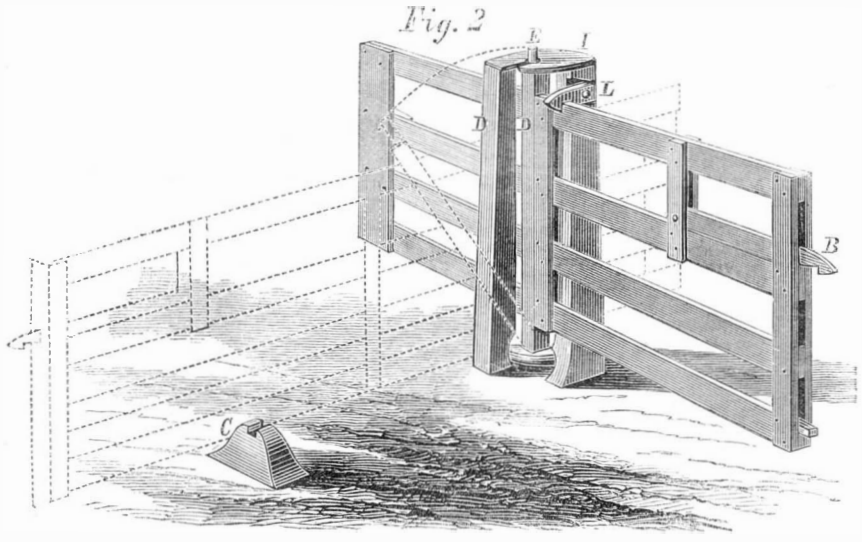
Patented April 27, 1869, through the office of the Scientific American, by J.T.Moxley, whom address for further information at Owasso, Mich. See advertisement on another page.

Fig. 1



MOXLEY'S FARM GATE.

Fig. 2



Suspension Bridges.

In the construction of suspension bridges, the ties, or ropes from the main cable, sustaining the roadway, are of twisted wire as well as the main cable. With the alleged advantages of twisted wire ropes, for this purpose, over straight iron rods, I am not aware that the less expansion and contraction of the wire ropes, by changes of temperature, have been recognized.

A hempen rope will contract in length when wetted, owing to the minute particles of water acting as wedges, increasing the width and the convexity of its spiral curves. The fibres of the same hemp laid straight, will not be shortened by wetting, but when in small fragments, as when made into paper, will be expanded in a similar manner by wetting.

An iron rod and wire rope of equal lengths would expand equally by heat, waiving the above referred-to property, but the wires of the rope being in contact, and expanding laterally, would, by an equivalent wedge-like action, increase the convexity of the curves and tend to shorten the rope. By a reverse operation cold contracts and flattens the spiral curves, and tends to lengthen the wire rope, as with the hempen rope, when dried and stretched.—*T. W. Bakewell.*

Steam Boiler Incrustations.

According to the *Chemical News*, M. E. Wiederhold states that the hardest incrustations of this kind are formed when the quantity of carbonate of lime amounts to from 20 to 25 per cent of the entire mass. He has found, by an experience extending over several years, that some kinds of clay, among these the substance known as *kieselschiefer* (a peculiarly fatty clay), when suspended in the water, contained in steam boilers, prevent the particles of carbonate and sulphate of lime dissolved in the water, even if the latter is very hard, to cling together, and become fixed to the sides of the boilers, forming there a hard incrustation. A series of experiments, made on purpose, and continued for a sufficient length of time to yield a reliable result, has fully proved that the addition to the feed-water of the steam boilers of fatty clays, especially the kind known as fuller's earth, entirely prevents boiler incrustations, even where, of necessity, very hard water has to be used as feed water. A loose, soft mud is deposited as soon as the motion of the water, due to the boiling, ceases on cooling. This mud readily runs off on opening the sludge valve of the boiler.

Increase of Weight During Combustion.

The *Chemical News* gives a description of an interesting experiment. A small horseshoe magnet is hung up at the beam of a balance sufficiently sensitive to turn with centigrammes; the poles of the magnet are immersed for a moment in the *limatura ferri* of the chemists' shops, and a beard of small particles of iron is caused to adhere to the poles; by means of proper weights placed on the scale-pan at the other end of the beam the equilibrium is restored. This having been done, the finely-divided iron is kindled, by approaching to it the flame of a Bunsen gas burner, and continues to burn. While burning, it will be seen that the arm of the balance on which the magnet is suspended considerably deviates from the horizontal position, thus indicating an increase of weight on the side where the experiment is going on. This experiment succeeds best with a magnet of moderate dimensions; the horseshoe magnet applied in this instance weighed, without its armature, 210 grammes, and can bear a load of 12·5 grammes of iron; when this is altogether converted in magnetic oxide, by combustion, the increase in weight will be about 4·7 grammes.

IMPROVEMENT IN OPEN FIRE GRATES.

Great as have been the improvements in all kinds of domestic heating apparatus, we all know that a very large proportion of the available heat still eludes us and passes through chimneys to the open air. And there is no doubt also that much of the combustible matter is distilled rather than burned, and passes off as gas, not only failing to give its share of heat but taking with it a portion of the heat furnished by that which is consumed.

Fig. 1

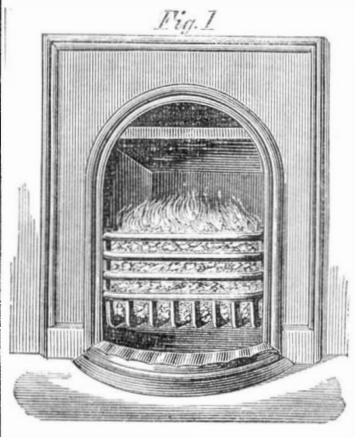
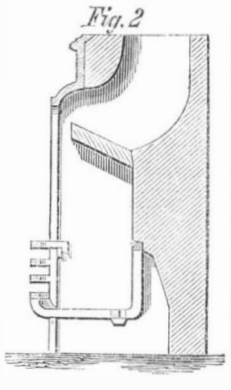


Fig. 2



Our engravings exhibit a form of grate called by the inventor a Perfect Combustion Grate, calculated to obviate these losses, by securing more perfect combustion, and using to greater advantage the heat produced.

To secure these ends the grate is constructed as shown in front elevation, Fig. 1, and in section, Fig. 2. It will be observed that the mason work at the back of the grate is recessed to allow the air to flow freely up around and to enter the interstices of the grate as well at the back as the front. By similar means the air also enters the ends of the grate to supply all parts of the incandescent coal equally with the oxygen necessary to combustion. The air also becomes heated in this chamber previous to entering the fuel, and is thus in the best condition to favor combustion.

The ashes, when the grate is stirred, fall back into the recess instead of pouring forth into the apartment, and thus one of the objections to the use of grates, which has greatly retarded the employment of this most wholesome and pleasant of all the means employed for burning coal in dwellings is removed. The inventor claims that the use of this grate will cure smoky chimneys on account of the more perfect draft secured.

The back is made separate, and can be used with ordinary baskets, in grate fronts of any pattern and with all grates by re-setting. It is simple in construction, and not liable to get out of order. The inventor also states that air-heating compartments are successfully used in connection with it.

State and county rights may be obtained on application to the inventor, who will also furnish full-sized patterns gratis to purchasers.

Patented through the Scientific American Patent Agency, August 25, 1868, by G. H. McElevy, Newcastle, Pa., who may be addressed for further information.

Lurmann's Blast Furnace.

Engineering states that a considerable number of German ironmasters have, during the last two years, applied to their furnaces the system of Mr. Lürmann, the manager of the Georg-Marien Mining and Iron Company, of Osnabrück, Prussia, the improvement consisting in closing the front of the hearth, thereby dispensing with the dam stone, tymp, etc. A scoria outlet is set in the closed breast at a distance of about 6 in. below the tweers, and through this outlet the slag runs off regularly and constantly. The tapping hole is placed where the heat is greatest.

This arrangement has been successfully worked for six months or more at the Old Park Iron Works, Shropshire, and more than one of our leading ironmasters have expressed their intention of adopting it. Its advantages are thus enumerated:

1. The slag discharges itself through the scoria outlet at about the same level, therefore there are no vacillations of the slag in the hearth, and the corroding of the wall is diminished.

2. As there is no fore-hearth, there are of course no repairs, and no breaking up of the scoria crust in the same. This is equal, as shown above, to a saving of at least twenty days per year. Suppose a large furnace produces forty tuns per day, the same will yield at least eight hundred tuns per year more, if built on Mr. Lürmann's principle than if it were of the ordinary construction.

3. As there are no interruptions, the furnace does not cool. It works more regular, as the heat in the furnace is always the same.

4. The doing away with the dam and the fore-hearth allows the removal of the tapping-hole from the former into the wall of the hearth. The opening of the tapping-hole is then easy, as it is close to the greatest heat.

5. The completely-closed hearth allows a considerable increase of the pressure of the blast, because a throwing out of materials has become impossible.

6. The increase of the pressure is always of great importance, but especially where pit coal, anthracite, etc., are used; and where the layers are compact. The number of charges can be greater, effecting a corresponding increase of produce.

7. The augmentation in the number of tweers, and the equal distribution of them, made feasible by the doing away with the forepart of the hearth, allow a better and equal distribution of the blast in the hearth; the furnace therefore works better, and a greater quantity of ore is smelted, provided there is sufficient blast.

8. The number of hands may be lessened, as the operations are few and easy; the same need not be of great skill and experience. No fire clay and other refractory materials for the repairs, and less tools, are wanted. It may be mentioned that formerly the smelters of Georg-Marien-Hütte, when working, were almost stripped; now they are always in full working dress.

To Clean Oilcloth.—An oilcloth should never be scrubbed with a brush, but, after being first swept, should be cleaned by washing with a soft flannel and lukewarm or cold water. On no account use soap or water that is hot, as either would have a bad effect on the paint. When the oilcloth is dry, rub it well with a small portion of a mixture of bees' wax, softened with a minute quantity of turpentine, using for this purpose a soft furniture polishing brush. Oilcloth cared for in this way will last twice the time than with ordinary treatment.—*Septimus Piesse.*

We have received a number of communications on the subject of street crossings, none of which seem to us to contain any practicable suggestions, they are therefore declined with thanks.

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FACTS ABOUT THE CROTON WATER SUPPLY.

One of our cotemporaries says, very irreverently, of the Croton, that it is "played out," and recommends resort to Artesian wells.

The aqueduct which conveys the Croton to the city is constructed to bring down 60,000,000 gallons per diem, but when the pressure is ample at the dam, which it is for ten months in the year, it delivers as much as nine or ten millions of gallons in excess of that quantity, and at the same time a vast amount of water runs over the lip of the dam.

Mr. Jarvis, some years ago, gaged the river at its supposed lowest point, and estimated the minimum supply at about 32,000,000 gallons, or about one half of the quantity required, and he recommended storage reservoirs to satisfy the wants of a future large population.

It will be recollected that in providing for its transmission over the High Bridge, the Commissioners then in charge laid but two iron pipes capable of carrying only a part of what the aqueduct brought, it being then supposed that the city would not require a larger quantity; but during Mr. Craven's administration of the Department additional pipes were laid equal to the whole power of the aqueduct. The growth of population and the use of the water for manufacturing purposes made this additional provision necessary.

Under the auspices of Mr. Craven, the Croton valley, which consists of 328·82 square miles, was carefully examined to ascertain its capacity to accommodate a still larger population, with its additional manufacturing wants, and it was found that in Putnam and Westchester counties there were fifteen places at which storage reservoirs might be conveniently constructed.

On the Muscoot, which receives the outlet from Lake Mohopac and falls into the Croton near Katonah; there were four of such sites. A, containing 485 acres, capable of storing 5,211,015,625 gallons. B, of 192 acres, capable of storing 1,701,835,207 gallons. C, 730 acres, capable of storing 6,589,101,562 gallons; and F, 600·75 acres, capable of storing 6,120,335,937 gallons. On the west branch of the Croton, which, after receiving the middle branch, unites with the east below Croton Falls village, there are three: D, covering 1,008 acres, and capable of storing 9,033,632,812 gallons; E, of 303 acres, to hold 3,369,206,857; and K, immediately above Croton Falls village, consisting of 512·74 acres, to contain 5,671,449,219 gallons. On the middle branch, two: L, 262·75 acres, to hold 2,328,218,733 gallons, and G, 452·19 acres, to contain 4,861,035,156 gallons. On the east branch three: H, containing 384·67 acres, to contain 2,490,062,500 gallons; I, 449 acres, to contain 4,205,820,654 gallons; and J, 191·38 acres, to contain 2,314,074,703 gallons. On the Titicus, which unites with the Croton at Purdy's Station on the Harlem Railroad, one, M, which floods 492·75 acres, to store 4,392,131,445 gallons. On Cross river, an affluent of the Croton, at Katonah, N, covering 197 acres, for storing 1,676,049,171 gallons; and O, on Beaver's Dam Brook, which crosses the Harlem below Mount Kisco, consisting of 239·47 acres, and to store 2,182,337,109 gallons. Their joint capacity exceeds sixty-one billions of gallons, and they cover over six thousand five hundred acres of land.

In 1867, Mr. Craven, finding that it had become necessary to guard against the want of water in a season of drought, procured authority to construct one of the fifteen reservoirs, which he had located; and after commencing the one marked G, and abandoning it, because of the danger of flooding the celebrated Tilley Foster iron mine, finally decided on building the one at Boyd's corners designated as E.

By reason of the failure of the original contractors, the dam at E, now raised (except at the north end) over 40 feet of the 64 which is required, is being worked by their securities under such disadvantages that it will not be finished much before 1871, but it is possible to use it in the summer of 1870 for storage up to the hight which may then be reached. It will be seen, however, as this reservoir is capable of holding 3,369,206,857 gallons, it will, when finished, supply 60,000,000 gallons per day for about fifty-five days, supposing that the evaporation and loss on its way to the main dam shall be equaled by the ordinary flow of the stream.

Inasmuch, however, as the Croton is supposed to furnish more than half that quantity in the season of the greatest drought, it is clear that the city will, even during dry seasons, be supplied with as much water as the aqueduct is competent to deliver.

The great drought which has prevailed for most of the summer, along nearly the whole Atlantic coast, was broken so far as this region is concerned, by the rain which fell on the last Saturday and Sunday of September; but as the ground was dry beyond any recent experience, the dam at Croton was raised only a few feet. The rain of Saturday evening and Sunday and Monday, the 2d, 3d, and 4th of October, had, however, a visible effect in swelling the Croton to the proportions of a freshet, yet although more rain is wanted, all fears of a scarcity of water may now be dismissed. Under any circumstances the minimum flow will furnish thirty gallons per day to each inhabitant, which is more than will be required for household purposes.

On Monday, the 4th inst., the water in the main dam had risen by 10 o'clock, A. M., so that it commenced to run over, and at 2 P. M. the volume pouring over was a foot in depth. Inasmuch, however, as the city is now using nearly the whole supply, the reservoir in the city will scarcely be filled before some time in November.

Nothing has contributed more to the convenience of the city than its supply of water at an elevation which, among other benefits, makes it the power or carrier for removing the refuse from houses. The growth of New York in manufacturing industry, has been so much promoted by using the surplus, that the time is not distant when other storage reservoirs and a larger or additional aqueduct will be required. From the particulars we have given, it will be seen that whenever the city chooses to avail itself of this bounteous provision, not only our increased domestic wants, whatever their extent, will be easily satisfied, but there will be a surplus to be devoted to manufacturing purposes.

The lowest elevation of any of these reservoirs is the one laid out on the Beaver Dam brook, which is 250 feet above tide water. The others vary between this and 600 feet. The formation of the valleys of Putnam and Westchester is highly favorable to these structures, and it is probable that no city of great extent is more liberally provided. Each location is inclosed with high hills, which, after allowing a sufficiently wide expanse, suddenly contract so that a short dam will complete the reservoir. The Croton was wisely chosen for this purpose, and so far from being "played out," it will eventually supply the largest population known to modern times.

The Commissioners who manage the Croton are not armed with any other authority over the contract now being executed except to declare it void, and then to relet the work. If proper vigor were used by those who act for the contractors, the work could be finished by next summer, but it would be a losing job. The contract called for its completion before this, and it is probable that sympathy for the securities, and the want of agreement which is shown between the city government and Board—which latter has the confidence of the community—prevent effective steps to secure the prompt completion of the work. The expenditure originally authorized is limited to a sum which does not permit the additional expense which haste would require. It is scarcely probable that a drought next summer will follow the one of this year, but if it occur the loss to the city will be visited upon those who are responsible for the delay.

CIRCULAR MOTION AND RECTILINEAR MOTION.

We find in an exchange an article endeavoring to draw amusement from the writings of Vitruvius, upon the principles of mechanics. One of the extracts made from this ancient author, who lived a short time previous to the birth of Christ, is the following: "I have briefly explained," he says, "the principles of machines of draft, in which, as the powers and nature of the motion are different, so they generate two effects, one direct, the other circular, but it must be confessed that neither rectilinear nor circular motion can without the other be of much assistance in raising weights."

Now, so far from seeing anything very amusing in this statement, the more we consider it the more we feel surprise at the comprehensiveness of the proposition. We see in it a generalization, the truth of which is exemplified in every machine. So large a proportion of the motions of the parts of machinery may be included in the classes rectilinear and circular, that the very few exceptions wherein the curvilinear motions are other than these, are scarcely worth consideration; and wherever they are employed it is always at a sacrifice of economy in power, the former motions being the least expensive of movements. Where, as in the case of the crank and pitman, a rectilinear motion and circular motion are coupled, there may be a loss in the application of the power to useful work, always consequent upon the increase of the number of moving parts in a machine; but when a crank drives a pitman, or winds up a rope on an axle, the losses suffered in these arrangements of working parts, are consequent upon practical difficulties. In theory there should be no loss. We know that these losses are referable to friction, inertia of parts, rigidity, etc., and therefore in theoretical formula for computing the powers of such arrangements, we do not take into account these losses. In the practical application of theory, allowances are made for such losses, but fewer such allowances are requisite when circular motion is employed than when any other is used to perform work. Motions in right lines, in circles, or arcs of circles, have proved in an experience of twenty centuries, to be, as Vitruvius said they were, the motions to be principally relied upon in mechanics.

Of these, circular motion is by far the most extensive in its application, and it is often an element where it is scarcely suspected.

The power of the inclined plane is generally referred to the plane itself, and mathematical demonstrations are based upon its proportions and inclination, but in the case of a round body rolled up the surface of an incline, the power may be calculated directly from the dimensions of the circle and the angle of ascent. In this case the element of rotary motion is generally overlooked, although it most certainly is an important element in lessening friction, which, when bodies are simply slid up an incline is an enormous source of waste; and, as we have said, it may be made the basis of computation for mechanical power.

It also is an element in the use of all hand percussive tools, as the hammer, ax, etc. The lever, too, also involves circular motion. It is evident that Vitruvius saw the full importance of these motions when he penned the paragraph alluded to; and as to confining the proposition to the raising of weights, it is not improbable that he comprehended the fact that a constant force is required to raise a given weight to a given hight in a given time, and appreciated the utility of making the force required to thus raise a given weight the standard for the measurement of power applied to any kind of work.

In modern times we use the foot-pound as a unit of work and thus have applied a hint which might easily have been drawn by a reflective mind from the passage quoted.

We may justly pride ourselves on modern progress in science; but the old philosophers undoubtedly saw and comprehended more than is sometimes credited to them.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

An interesting branch of American manufacture, is that of SPOOL COTTON THREAD. This is exhibited in all the processes of the manufacture from the raw cotton to the finished thread by Greene & Daniels, of Providence, R. I. The first process is the carding, which is done in the ordinary way of carding cotton. It is then drawn in the usual manner, and then taken to a lap machine, consisting, essentially, of the old-time railway head, with drawing rolls attached. This machine is very compact, and, we are told, is the best machine for the purpose now in use. It is strictly an American machine. The cotton next goes through a process called combing, on a machine called a combing machine, the only machine of foreign construction employed in the work. This contains eight thousand needles, the action of which upon the cotton gives it a peculiar silky, light, and gauzy appearance, and the operation of combing may be considered as the finishing operation in preparing the cotton for thread; all the subsequent operations tending directly to the formation of the thread itself. The cotton, after combing, is drawn three times, and then spun into roving not larger than wrapping twine. It is now spun into yarn of wonderful fineness and uniform thickness, on a ring spinning frame. It next passes to a doubler, and is laid up in two or three-ply, as desired. From this machine it passes to a twister, which speedily reduces it to a fine and beautiful cord. These cords are then twisted on another frame to make a three or six-cord thread, as required. It is next reeled into skeins, then bleached, when it is ready for spooling. The spooling machine is a small but pretty machine, on which the winding is done with great celerity. The thread is now ready for market, except packing, etc. The finished thread shown is of excellent quality, and its applicability to sewing-machine work is demonstrated by its use on a sewing machine in the same inclosure with the machinery for manufacturing the thread. This display excites much interest in the visitors to the fair, and is a fine feature of the exhibition.

Adjacent to this inclosure stands a

CIRCULAR LOOM

for weaving twilled shade line, used for hanging pictures, window shades, etc. This loom weaves a texture which covers a strong central linen cord. The outer texture is of wool, silk, or cotton, or mixtures of these materials. The peculiarity of this loom is, that the shuttle stands still and the warp travels. It cannot be well described without diagrams, but it is a very ingenious, compact, and beautiful machine. It is exhibited by Palmer & Kendall, of New York.

S. R. Parkhurst, of Newark, N. J., exhibits a

BURRING MACHINE,

with patent steel ring feed rollers adapted to clear all grades and qualities of wool, even the most difficult Mestizo. He also exhibits a newly constructed double-cylinder

WOOL AND COTTON PICKER,

which, it is claimed, will pick, dust, bur, oil, and mix the wool ready for the cards at a single operation. He also exhibits a Double-cylinder Cotton Gin, improved by the addition of double cylinders and connected with a steel brush, and an endless slotted apron to convey the cotton in the seed to the ginning cylinders, thereupon securing the seeds and conveying them away from the ginning parts of the machine. It is claimed that this gin will separate the seed from 700 lbs. of cotton per hour, without injury to the staple. A

METALLIC WASTE CARD,

for working or reducing yarn, thread waste, and soft flannels to wool is shown by Chas. G. Sargent, of Graniteville, Mass.

These machines are, in principle, carding machines, clothe

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with strong, sharp-pointed steel teeth, so adjusted as to work on the twist of yarn or thread waste—combing or teazeling out gradually, the twist holding the fiber of wool together, and forming it into a thread. This gradual removing of the twist by the combing or carding process, leaves the fibers of wood composing the thread waste long and strong, with nearly the original length of staple. This gentleman also exhibits an improved machine for cleaning fibrous materials, essentially the same patented by him in 1861.

Chapin & Downes, of Providence, R. I., exhibit a

DOUBLE-CYLINDER LONGITUDINAL GIG,

which, among other advantages that have caused its extensive adoption, is arranged to work on broad or narrow goods, gigging two narrow pieces in the same time, and with as much facility as one broad piece.

C. L. Goddard, of New York, exhibits a patent Steel Ring Burring Machine, attached to a wool-carding machine. A peculiar feature of this machine is the solid packing rings, which are whole, like the steel rings, and make the cylinder permanent and solid until worn out. The same gentleman exhibits a

MESTIZO WOOL-BURRING MACHINE,

which combs open the wool by a comparatively slow and harmless process, and removes the dust, Mestizo,and all other burs, or other extraneous matters,at the same time, oiling the wool.

H. W. Butterworth, of Philadelphia, Pa., exhibits a warp dryer,which, however, has not operated at any time we have been at the Fair as yet. It looks, however, like a good machine.

The Empire Heddle Works, of Stockport, N. Y., exhibit one of their patent heddle frames, which might, from the adroitness of its movements, be almost fancied to be alive. It forms the eye in a new manner, making the twist next the eye so tight that the finest warp of woolen, cotton, or silk can not enter. It gives any requisite shape or size to the eye,and sharp angles, at the ends, are avoided. Both the machine and the heddles it makes, elicit much favorable comment.

These are, we believe, all the machines on exhibition connected with textile manufacture, and our readers will doubtless agree with us, that the display is very meager. It certainly does not properly exhibit the progress made in the manufacture of such machinery in the United States.

There is a fine display of

MACHINISTS' TOOLS

in the machinery department, though it cannot be called a very extensive one. It, however, pretty fairly represents the present status of the manufacture in the country.

The machinery of this kind is placed in inclosures allotted to the various manufactures. Three prominent manufacturers are represented, and we will notice the displays of each separately.

Hewes & Phillips, of Newark, N. J., exhibit a Planer which will do work 2½ feet in width or hight, having nothing novel except the belt-shipping lever, by which lead is given to either one or the other of the belts at will. A saving in wear of belts is claimed for this arrangement,and ease in taking apart and putting together. The belt shippers are supplied with gibs which can be replaced when worn. This firm also exhibit a 12-inch upright boring press, evidently a good tool. The pattern is new. The head can be raised and lowered independently of the feed, which is utomatic. It has a peculiar arragement of back gear, the head is balanced,and there are other good features. They have, also, on exhibition, a 6-inch slotter, a very compact and powerful machine, and a 20-inch lathe, 12 feet long. All these machines are handsomely finished and their designs are good. A peculiarity of the machines made by this firm,is eccentric gearing on all the tools where a quick return is desired, by which they secure a quicker return than any other similar machines exhibited. They have, also, in their inclosure, an 84-inch gear cutter, which, though presenting, perhaps, no novel features, is worthy of remark for its general excellence.

Wm. Sellers & Co., of Philadelphia, Pa., exhibit a 16-inch lathe, 13 feet in length, with a very novel and interesting feature. The feed gear for ordinary turning is composed of friction wheels, so arranged that, by a lever, which the workman operates with the left hand (the right hand remaining free to operate the other parts of the lathe), the feed may be slackened or accelerated at will, without any alteration in the speed of the lathe. This feature will give increased facilities in certain kinds of work, and the device is generally admired by the many experienced mechanics who witness its operation. This lathe has also a system of back gear by which a perfectly positive motion is attainable when desired. Sellers & Co., also show a powerful 48-inch slotter, with compound table, a shaping machine, for small work, and a bolt cutter, all of which are well known to the mechanical world, and need no special comment from us, except that they fully sustain the enviable reputation of this firm. They also exhibit several sizes of the celebrated Giffard injector, with a model showing the internal construction of this paradoxical instrument. Also, a 25-inch planer, of a very simple construction, and, in every respect, praiseworthy.

The shafting which drives these machines is supplied with oil from Wickersham's American Oil Feeders, manufactured and exhibited by J. B. Wickersham, 143 Front st., Philadelphia, Pa., which have not only received the indorsement of Sellers & Co., but many other prominent mechanical engineers throughout the country.

Wood, Light & Co., of New York, exhibit a bolt cutter which has some novel and valuable features. This machine is so constructed that the dies close accurately to a certain point, so as to form, in effect, a single solid die. When the cutting is done, these dies open automatically, and the bolt is shot out. It cuts threads of any length, always true to the body of the bolt,and all the bolts made by the same dies will be exactly alike. All the movements of the machine are automatic, the attendant's duty being merely to keep the machine in order and supply the blanks as wanted. The same firm exhibit a shafting lathe which attracts much attention and elicits much favorable comment. This lathe employs three cutting tools, and finishes a shaft at a single operation. A longitudinal trough is made in the bed of the lathe, and in which a solution of soda is placed, this fluid being pumped up and poured constantly upon the shaft at the point of cutting. This lathe, and the bolt cutting machine exhibited by this firm, and the lathe exhibited by Wm. Sellers & Co., combine more novel features than anything else among the machinists' tools displayed.

Outside of these inclosures are scattered about a variety of machines and implements, some of which we shall notice in the present article. There are on exhibition a considerable variety of

DROP PRESSES, BLANKING PRESSES, PUNCHES, DROP HAMMERS, ETC.

Charles Merrill & Sons, of New York, exhibit an Air-spring Forge Hammer, and a Drop Hammer. The air-spring hammer runs with little noise, and, by a peculiar arrangement of the cylinder and piston, the hammer is driven by air springs, which saves the machine from jar,other than the blow on the anvil or work.

The cylinder and hammer moving in vertical slides, each blow is square, exactly in the same place, and some kinds of die work can be forged as exact as under a drop, with greater rapidity. It is under the perfect control of the operator, and can strike light or heavy, slow or fast, as desired.

The drop hammer is so constructed that the operator can raise and drop the weight from any hight in the slides, can stop the weight after it begins to fall,or can let it settle down slowly.

Parker Brothers, of West Meriden, Conn., exhibit one of their highly finished and excellent power presses, which are favorably known to the manufacturing public as the Fowler Presses—an excellent tool, as we know from experience.

Mays & Bliss, of Brooklyn, N.Y.,exhibit a beautiful Double-action Power Press, very strong and compact, of easy adjustment, with the feed rollers so constructed as to carry off all scrap metal. It is claimed that this machine will cut and bur 60,000 blanks in ten hours.

The Farrell Foundery and Machine Co., of Waterbury and Ansonia, Conn., also exhibit a Double-acting Press, of very compact form, which cuts and draws sheet metals into cup-shape at one operation. This is an excellent machine and deserves special notice.

Post and Goddard, of New York, exhibit an improved Emery Grinder. This machine was described and illustrated on page 324, last volume, of the Scientific American, to which the reader is referred. It may be bolted to a bench, the frame stand consisting of a single casting, containing bronze boxes for the spindle. It has rests, which can be readily set on the side or face of the wheels, and removed when not wanted, the whole forming a neat and convenient arrangement. This firm also exhibit various sizes of their Tanite Emery Wheels in connection with the above machine.

The New York Tap and Die Co. exhibit a fine collection of taps and dies,and the American Standard Tool Co. show a case of beautiful Twist Drills, arranged on a revolving platform. These drills are so well and favorably known that they need no praise from us. Any mechanic, who examines them, will pronounce them excellent.

Nathan & Dreyfus, of New York, exhibit their patent Self-Oilers and Engine Cups, composed of a transparent glass cup, mounted in Britannia and brass, provided with a hollow tube, inside of which is placed a loose-acting solid wire, which acts as a feeder and regulator. The wire rests constantly upon the journal, thereby acting with the bearing in its motion. The wire is so regulated inside the tube as to feed according to the demand only. There is no flow of oil whatever while the machinery is not in motion.

Charles Parker, of New York, exhibits an extensive line of his patent Parallel Vises with recent improvements, among which we notice an adjustable collar, which causes the jaws to open or shut, upon the slightest movement of the handle. There is thus no lost motion; and again, if the shoulder on the screw should wear, the collar can be so adjusted in a few moments that it will operate as readily as when new. Another improvement, is an adjustable spring so arranged as to hold the handle of the vise in any position or angle at which the hand leaves it,thus avoiding the pinching of fingers,which is of frequent occurrence,when the ordinary handle is in use; and, again, if the workman wishes to hold any article, however slightly, he can do so, when, with the ordinary vise, the weight of the handle would either grasp the article too hard or release it entirely.

There is, perhaps, no finer display in this department than the exhibition of

SAWS,

by R. Hoe & Co., of New York, and the American Saw Co., also of New York. It would be impossible for us to enumerate here all the varieties of saws displayed. They are of all sizes, and of all shapes known to the saw trade,finished and mounted in superb style. Our readers are already aware of the distinguishing features of the saws made in each of these establishments as they have long been extensive advertisers in these columns. Their wares have earned a very high reputation. These firms, undoubtedly, lead the saw trade in this country. Fine taste has been shown in the arrangement of their collections at the Exhibition, and they are greatly admired by all visiters to the department. The punching of the saw plates shown by the American Saw Co., is performed, we are told, by Ivens & Brooks' combined punch and shears, a model of which was shown us. It is to be regretted, that this fine tool was not shown in operation at the Fair, as it is certain that it would have made a most favorable impression.

We take this occasion to say a word upon the

ELECTRIC ORGAN

exhibited by Hall, Labagh & Co., of New York. The strains of this instrument attracted our attention as we were about to leave the building after taking the notes we have condensed into the present article. This organ was described on page 347, last volume of the Scientific American. It is the invention of H. L. Roosevelt, of this city. The inventor has furnished us with the following particulars in regard to it: "The keyboard is detached from the organ at a distance of about twenty-five feet, though it might as well be removed to the distance of twenty-five miles, excepting for the necessity of the organist hearing his own performance, since we know from from recent scientific investigations that the electric current will travel a mile almost instantaneously. The only connection between the key-board and the body of the organ is a bundle or rope of flexible, insulated copper wires, which may be carried in any direction without injury, and there is no pull or strain on these wires, as they are merely the passive means of conducting the electric current.

"The source of the electric current is an ordinary 'single fluid' battery, placed in any convenient position, composed of a series of jars containing a mixture of sulphuric acid and water, and in each jar is suspended a plate of carbon, in company with two plates of zinc, connected in the usual way by copper wires. From one end of this series of jars, a copper wire proceeds to the keyboard; and, if we take the case of a single key, for example,when it is pressed down by the finger of the player,we shall find this wire so connected that it forms an unbroken circuit and proceeds from the keyboard onward to the body of the organ, where it is coiled around a soft piece of iron shaped like a horseshoe,and thence returns from the organ to the other end of the battery. When a wire is connected with both poles or ends of a battery the current passes and the piece of soft iron becomes a powerful magnet; but the moment the current is broken, by disconnecting the copper wire, there is an instant loss of power. When the key of the organ is not touched the wire is not connected and the current passes; but on pressing down the key a metallic contact is formed, the electricity darts along the circuit and the electro-magnet, becoming at once excited, pulls down the pallet or opens the valve in the wind chest, admitting air to the organ pipes, and, with lightning speed causes them to speak. The couplers are applied and the stops drawn upon the same principle."

We also noticed, in passing, some specimens of artificial stone, manufactured and exhibited by the New York Stone Works, Bandman & Hollman, 75 William st., New York. This stone is a conglomerate sandstone, artificially produced, and is molded into large blocks for hydraulic structures, and also into floor tiles and ornamental architectural work of all kinds. The exhibitors claim, that this stone is superior in strength to any natural sandstone found in the United States, and that it will not scale like the brown sandstone now largely in use for ornamental building. It can be given any color or shape desired, and is twenty-five to seventy-five per cent cheaper than natural stone, cut into the requisite form. It can also be molded into statuesque forms.

American Manufacture of Machine Twist.—An error crept into our report on the Silk Department in our issue of October 9. It was there stated that the machine twist made annually in the United States amounted to a quarter of a million dollars. It should have been a quarter of a million *pounds*, the value of which would be fully three millions of dollars.

INTERESTING PATENT DECISION---WHEN DOES AN ENGLISH PATENT TAKE DATE?

The Commissioner of Patents has just given a decision in a case involving the question as to the date to be borne by patents which have been patented in foreign countries. The case on which the decision is given is the application of James Cochrane for the correction of the date of letters patent granted to him March 31, 1857, for an improved fluid meter. Cochrane obtained letters patent in England and also in the United States. The English letters patent were dated November 19, 1855, when the provisional specification was filed. They were sealed May 19, 1856. A caveat was filed in the U. S. Patent Office November 7, 1855, but application for the letters patent was not made until Nov. 5, 1856. The patent was granted March 31, 1857, but was limited to "fourteen years from the 19th day of November, 1855." The applicant now claims that the American patent should bear date from the day it was issued, and asks the correction of an assumed clerical error. The Commissioner says:

The motion presents several interesting questions.

1st. Can the mistake if it exists be corrected as a clerical error?

2d. Was there an error in limiting the American patent to fourteen years from November 19, 1855?

3d. If there was an error what is the proper limitation of the term of the letters patent?

After examining the first question and quoting quite a number of authorities, he arrives at the conclusion that it could never have been the intention of the Legislature to restrict the correction of errors to those enumerated. Accordingly it has been the practice of the office to correct all errors in parties' names titles, dates, and all omissions or insertions of words made by the fault of the office upon a surrender of the patent without fee, but to require the patentee when seeking the correction of his own mistakes to pay the fee and conform to the provisions made for cases of reissue.

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The answer to the second question involves the inquiry as to the true date of the English patent, within the meaning of our laws. The act says "that no person shall be debarred from receiving any invention or discovery, etc., by reason of the same having been patented in a foreign country more than six months prior to his application; provided, that in all cases, every such patent shall be limited to the term of fourteen years from the date or publication of such foreign letters patent."

The words "date or publication" should the Commissioner hold to be construed conjunctively, the phrase in effect meaning date *and* publication, and if there be a difference between the two, the latter time should be held as the true date. After a review of the practice in the English patent law, the Commissioner says: "As the invention in its perfected, completed form is not published until the enrollment of the final specification, as in fact much of the invention may be made between the time of the filing of the provisional and completed descriptions, it would seem that the date and publication which is to determine the limit of a patent in this country, should be the date of the filing of the complete specification."

The answer to the third question as to the limitation of the term of Cochrane's patent. Under the act of 1836 the inventor who took out a patent in a foreign country more than six months prior to his application in this country forfeited his right to an American patent. But if within six months, it took date from its issue here and ran the full term of fourteen years. The 6th section of the act of 1839 had no reference to those who made application within the six months. If made within the time, it bore the date of issue and ran fourteen years from that date. This view of the case is supported by citations from various decisions. It follows, therefore, that in the present case, Cochrane's application having been filed within less than six months from the time when his invention was "patented" in England, his patent is not affected by the provisions of the act of 1839, and must be corrected so as to run fourteen years from March 31, 1857, the date of issue.

OSBORN'S NEW TREATISE ON THE METALLURGY OF IRON AND STEEL.

A brief notice of this valuable and extensive treatise appeared in our last issue under the head of New Publications. It was our intention at that time to give it a review commensurate with its importance, but we find that to do this adequately would absorb more of our space than can be spared for the purpose. We shall therefore content ourselves with an outline of the character and origin of the work, and some extracts from its pages, one of which will appear in connection with this notice and some others in future issues. The author tells us in his preface that before he began the present work it was thought that a simple re-editing of Overman's Treatise upon Iron, would be sufficient; but that "upon a thorough examination it was found impossible to make that work meet the wants of those who would justly expect a recognition of the many important inventions and discoveries since its last edition was published, and who would not wish to read of anything as a theory which had become a fact, or of procedures which had passed away before the advance of metallurgic science. The author has therefore written a work entirely different in manner and matter."

The work is divided into four parts, the first of which treats of the theoretic metallurgy of iron. Under this head we are presented with a chapter on "the general principles of the chemistry of iron, another on the ores of iron, one on the special properties of iron and its compounds, a chapter on the theory of fluxes, and lastly an exhaustive chapter on fuel, in which the principal kinds of fuel used in the iron manufacture and in steam production are discussed, with remarks on wood, peat, coking of coals, manufacture of charcoal, and analysis of coals."

In Part Second, the practical metallurgy of iron is taken up and exhaustively treated in twelve chapters, in which all the approved processes are fully explained with detailed descriptions of the various furnaces, hot blast ovens, blast machines, etc., now employed in the smelting of iron ores.

Part Third treats of the manufacture of malleable iron, recent improvements in the construction of puddling furnaces, present modes of refining, forging, rolling, reheating furnaces, shearing, piling, etc.; and Part Four is an essay on steel, in which the various kinds of steel and the numerous processes now employed in the steel manufacture are duly discussed, according to their importance.

We find that in this work a common error of authors upon such subjects, has been avoided, and much of the merit of the work consists in the fact that no detail is supposed to be known by the reader, and nothing is jumped, or left to inference. The method adopted is a good one. The author sets out by a sufficiently elaborate discussion of the substances which have to be dealt with in the manufacture of iron and steel, and from the chemical knowledge thus obtained, the reader is led naturally and easily into the practical details of smelting, puddling, and refining iron, and the subsequent operations by which malleable iron is produced.

We have selected the following extract as a fair example of the clear style in which the author writes, and as also giving a good idea of the important part which oxygen plays in the metallurgy of iron.

"OXYGEN.—The air we breathe contains a large amount of oxygen, which plays an important part in the affairs of iron manufacture. It contains a large portion of nitrogen, with which, as metallurgists, we have but little to do, even supposing that steel contains a small amount—into which supposition we may hereafter inquire. It contains a very small portion of carbonic acid gas, a compound of carbon and oxygen, the former of which two elements, also, plays an influential part, determining by its amount, as carbon in iron, whether that iron be cast iron or steel, and, by its absence from iron, that the metal in question is neither cast iron nor steel, but malleable iron.

"Another fact: the atmosphere always contains more or less vapor of water. This water is composed of a large proportion of oxygen, and also a proportion, equal to twice the volume of this last-mentioned element, of another element and gas, hydrogen. The latter element is soon to become better known to the metallurgical world, but it is the oxygen of the vapor of water to which our attention is now called particularly. Here are *four elements*, important in the following order: oxygen, which is the supporter of all combustion, whether as flame or burning coal, and, like that which it supports, a splendid servant, but a labor-exacting master, ever waiting and watching, in its elementary loneliness, to unite with that for which it has affinity, either to help or perplex. Its union with iron forms that which we call the "rust" of iron, in which we see this affinity accomplished, for it has recalled the metal back to its primal state, namely, that of an ore, from which ore, or rust, it was made to become a metal only by the stronger affinity of the same element oxygen for carbon, whereby the act of rusting the carbon was followed by heat enough to expel oxygen from the iron rust in the ore, and leave the metal pure. That rust of carbon is the carbonic acid gas of the chemist. However rapidly in the one case, or slowly in the other, this affinity of oxygen may be exhibited, it is an affinity always in entire subjection to a stronger law of proportion, which it never violates, whether in the long-continued processes of nature, or the more intense and rapid fires and reduction of the furnace. That stronger law is seen in this: oxygen unites with iron in the proportion of only one atom of oxygen to one of iron; or, where a stronger cause exists, and larger affinity is exhibited, it is (never otherwise than as) one and the half of one atom of oxygen to one atom of iron (Ferric Acid excepted). Now, for the sake of brevity, the one-to-one proportion is called the one-oxide, or protoxide, and the other the one-and-a-half oxide; or, using the convenient Latin term, sesquioxide.

"Thus we have only two rusts, or oxides of iron, the protoxide and the sesquioxide. The latter is the highest affinity oxygen ever exhibits for *iron*, whatever higher affinities it may exhibit for other substances or elements. This oxide, therefore, may also be called the "high oxide," or, again resorting to the convenient Latin syllable "per," the peroxide of iron; so that the sesquioxide of iron, in this particular case of iron, is the peroxide, as there is no greater affinity of oxygen for iron known.

"In the case of carbon, however, we know of an affinity of one atom of oxygen to one of carbon; and again two atoms of oxygen to one of carbon. The former is always known as the oxide of carbon, or *carbonic oxide*, and the latter, inasmuch as the gas partakes of such acid properties that it will readily redden litmus paper (the chemist's test for acids) is called carbonic acid, or carbonic acid gas. Carbon is consumable, and oxygen, as we have said, supports combustion; all the conditions, therefore, of flame or fire, exist in carbonic oxide, and it is not remarkable that it is inflammable, and that the combustion should be attended by great heat. But an anomaly does present itself in the case of the other oxide of carbon, wherein the oxygen exists as the *peroxide*, or two-oxide state. We can and need only state this anomaly, namely, that where two parts of oxygen with one of carbon exist, combustion no longer exhibits itself, nor will the gas of this composition allow any combustion to take place wherever its presence exists to any great degree. When, however, from any stronger attraction or affinity, one atom of oxygen is drawn off from the two which go to form carbonic acid gas, and the resultant gas becomes possessed of only half as much oxygen as it previously possessed, the gas immediately becomes inflammable, and burns with great heat. Singular as it may seem, the addition of two atoms of the flame-supporting element, oxygen, to one of the combustible element, carbon, produces a gas which ceases to burn, nor can any combustion take place where its presence is abundant."

STEAM POWER ON CANALS.

In the annual report of the Hon. Van R. Richmond, State Engineer and Surveyor, noticed in our last, we find the following on the use of steam on our canals:

"Attempts have hitherto been made to substitute steam for horse power upon the canal. These have all thus far failed, probably from the fact, that the machinery used was not properly proportioned to the work which it was designed to perform, and that too high a rate of speed was sought to be obtained. The law connecting the resistances offered to bodies moving in water with the power required to overcome such resistances, may be stated as follows:

"The resistance varies as the *square* of the speed and the power exerted varies as the *cube* of the speed; hence, if two horses were sufficient to tow a boat at a speed of two miles an hour, the number required to tow the same at a speed of four miles per hour would be $(2—\frac{4}{2}\frac{3}{3}=\frac{2\times6}{8}\frac{4}{)}$ 16 horses. It appears, therefore, in order to double the speed, the propelling power must be increased eight times. The obvious effect of the double speed would be to reduce the time of transit one half; this, however, would be secured only at an expenditure for propulsion eight times as great as that due to a speed of two miles per hour.

"The foregoing determinations and comparisons are based upon the assumption that two horses will tow a loaded boat at a speed of two miles per hour upon the canal; as shown by M. D'Anbuisson's formula, 44 per cent more power is required to maintain the same speed in an indefinite fluid. For example, as shown in a former calculation from D'Anbuisson's formula, the traction or resistance encountered upon the Erie canal with the large class of boats, carrying 210 tuns, at a speed of two miles an hour, is 428 pounds, requiring about three horses; then the resistance, at a speed of four miles an hour, would be $(\frac{4}{2}\frac{3}{3}\times\frac{4}{2}\frac{2}{3}\frac{8}{)}=3,424$ pounds, requiring over 23 horses.

"If steam power should be provided sufficient to obtain an average speed a little in excess of that realized from present horse power, then it might undoubtedly be successfully and economically employed upon our canals.

"A successful application of the principle of low speeds seems to have been made by Mr. Edward Backus, of Rochester. If the result of the several trials made, are correctly stated by the inventor of this novel mode of steam propulsion, then the cost of transportation may be reduced about 32 per cent, as obtained from the following calculation, based upon the same general method employed for determining the cost of horse power. It is stated in the circular of results, by the inventor, that the extra cost of machinery and placing same in the boats is $2,500, and the consumption of fuel from 1,500 to 1,660 pounds of coal in twenty-four hours. Taking the same average for the boats hitherto used, and allowing 20 per cent for the aggregate detentions for the season (the same as now realized), and the following shows the cost of transportation:

Cost of boat and furniture	$5,000
Cost of machinery	2,500
Interest on same	5,250
Repairs of boat and interest on same	2 061
Expense of crew (same on boat with horse power) $185 per month	16,556
Expense of fuel (1,660 lbs. coal per day for 2,268 days) at $7 per tun	13,174
Total expense for ten years	$44,541
Total expense for one day	$19 64
Forty miles averaged per day for the season, per mile	491 cents
156 tuns average cargoes for the season, per tun per mile	3·14 mills

showing a saving of 32 per cent over horse power.

"The consumption of fuel, as reported, seems greatly in excess of that required, and can, undoubtedly, be reduced one half when the system shall have been perfected. Should this saving be realized, the cost per tun per mile will then be $2\frac{3}{1}\frac{6}{0}\frac{}{0}$ mills, a saving of about 50 per cent.

"The following extract from a letter written by Gen. Quimby, U. S. A., who witnessed two trials of this boat, will convey an idea of the character of this new mode of propulsion:

"In this boat the motive power, steam, causes a wheel located near the center of the boat to roll on the bottom of the canal, and thus drive the boat in the same manner that the locomotive is propelled by its driving wheels. The wheel, placed at one end of a lever frame, readily adjusts itself to the varying depths of the water, and its weight, together with the cog-like projections distributed over its circumference, prevents slipping and consequent loss of traction. It has been found that in the whole extent of the Erie canal there are not to exceed twenty miles in which the depth of the water is too great for the wheel to work well. For very deep water, a screw propeller wheel is used and the motive power is changed from the ground wheel to it with the utmost ease and expedition."

Dredging in the Gulf Stream.

Our readers are, perhaps, aware that a scientific examination of the ocean bottom in the Gulf Stream has been in progress under the direction of Professor Agassiz, assisted by M. de Pourtalès. The *Atlantic Monthly* for October has an interesting article upon this subject, from which we collate some particulars of the method employed and the object of this examination.

"Dredging in great depths is a slow and rather tedious process, requiring not only patience but very accurate observation. M. F. de Pourtalès, of the Coast Survey, has been engaged on board the *Bibb* for the last three years in making dredgings in the Gulf of Mexico. These dredgings have included every variety of depth, from the shore outward to soundings of six, seven, and eight hundred fathoms, eight hundred and sixty fathoms being the deepest. They have brought to light the most astonishing variety of tiny beings—especially crowded on rocky bottoms, but not altogether wanting in the deepest mud deposits. A report of the results obtained in his first two years' dredgings has been partially published by M. de Pourtalès in the Bulletin of the Museum of Comparative Zoölogy at Cambridge. They form a most valuable contribution to our knowledge of the animals existing in the deep sea.

"The dredge is a strong net about a yard and a half in length, surrounded by an outer bag of sail-cloth. Both are open at the bottom, but laced above around an oblong frame of iron. This frame has two arms, with a ring at the end of each. One of these arms is securely fastened to the line by which the dredge is let down; but the other, instead of being attached to the line, is simply tied by a weaker cord to the first. This is in order that, in case the dredge should be caught on the bottom, as often happens, one of the arms may give way, allowing it thus to change its position slightly and be more easily freed. It is an important precaution; for sometimes the dredge is caught so fast that it requires not only the force of the small engine to which the reel, holding seventeen hundred fathoms of line, is attached, but the additional strength of all hands on board, to disengage it. When the dredge is lowered—being of course weighted, so as to sink rapidly—a cord is tied around the bottom of the net, while the sail-cloth is left open; thus allowing the free escape of water from the former, while the sail-cloth protects it from injury. When the dredge is hauled on deck, a tub or bucket is placed under it, into which all its contents fall the moment the cord around the bottom of the net is untied. Some-

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times a large tub is filled at one dredging with all sorts of living specimens—shells, corals, shrimps, barnacles, sea-urchins, star-fishes, sponges, polyps, and sea-weeds, with all their natural brilliancy of tints."

A water glass is also used which "is nothing more than a square wooden tube, with a glass plate in the lower end. Sinking this under the water and looking through it, all the undulations of the surface, which distort objects below, are lost, and nothing obstructs the vision.

"Seen through this simple apparatus, the sea-bottom, or rather the summit of the reef above which we were floating, was like the most exquisite aquarium, the contents of which were ever shifting."

LONDON Bridge having become too narrow to accommodate the traffic over it, it is now proposed to widen it by throwing the foot-walks into the carriage-road, forming new footways upon cantilevers and brackets on either side of the road. This will increase the width of the carriage-way from thirty-five to fifty-three feet.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,465.—MANUFACTURE OF BOOTS AND SHOES, AND IN MACHINERY OR APPARATUS EMPLOYED THEREIN.—N. A. Baldwin, Milford, Conn. August 29, 1869.

2,640.—SPINNING MULES.—Samuel Oddy, Manchester, England, Robert Nuttall, Bury, England, and John B. Smith, Wappinger Falls, N. Y. Sept. 8, 1869.

2,664.—FIRE EXTINGUISHER.—G. F. Pinkham, Cambridge, Mass. Sept 11, 1869.

2,745.—SPINDLES AND FLYERS OF SPINNING FRAMES.—J. Goulding, Worcester, Mass. September 21, 1869.

NEW PUBLICA IONS.

AN ESSAY UPON FORCE IN NATURE AND ITS EFFECTS UPON MATTER. Cincinnati: Robert Clarke & Co., Publishers.

The theory of Newton that every particle of matter attracts all other particles of matter in right lines joining their centers, and in an inverse ratio to the squares of their distances by virtue of an inherent force called gravity, accounted for the motions of the planets so satisfactorily that it has been almost universally adopted by subsequent physicists as a natural law. Nevertheless there have not been wanting those who have doubted the correctness of this theory. Among these Faraday has been perhaps the most conspicuous. Without doubting the fact that what we call gravity varies as the squares of the distances, he claimed that the supposition that *a single force* could so vary was in conflict with the highest law in physical science capable of comprehension by the human mind, namely, the conservation of force.

The pamphlet before us is a very modest and calm statement of a doubt in regard to the truth of this celebrated and generally accepted theory, and though metaphysical, as all discussion upon an abstract notion of force must be, calls in mathematics to aid in the elucidation of a new theory which is, that "that all planetary movements are caused by the effect of force on matter—not inherent in matter; and further, that the one primal force on which planetary movement depends, modified by special effects upon substances differing in kind, in arrangement, and in position, is that which, under the modified conditions, is called by the various names of force, as of attraction and repulsion, cold and heat, electricity, magnetism, weight," etc. The latter portions of the essay, in which it is attempted to sustain the theory, are, as the author claims, merely suggestive; the first part being devoted to the attempt to demonstrate mathematically that the theory of Newton is untenable.

We are disposed to be lenient with the errors of an author who expresses his views so temperately and candidly as this, and though it would not be difficult to show some defects that, in our opinion, vitiate the whole argument, we do not think the topic of sufficient value to enter upon its discussion. Indeed the author himself asserts that he claims no scientific value for the discussion or the idea which led to it. We must therefore place this book among those works of which the world has seen too many; works seemingly written to no purpose but to indulge the love for speculation which has been a characteristic of certain minds in all ages.

THE GOLD FIELDS AND MINERAL DISTRICTS OF VICTORIA With Notes on the Modes of Occurrence of Gold and other Metals and Minerals. By R. Brough Smyth, F.G.S., Secretary for Mines for the Colony of Victoria. Melbourne: Printed and published by John Ferres, Government Printer. H. T. Dwight, 232 Bourke street, East. London: Trübner & Co., Paternoster Row.

This is a compilation in large quarto form, of an immense mass of information, historical, statistical, and technical, relating to the mineral resources of the Colony of Victoria in Australia. The perusal of the volume will, without doubt, excite surprise even in the minds of many Englishmen accustomed to regard Australia as a sort of *El Dorado*, yet having only a vague and very imperfect idea of the immense resources of that continent. Even many Anglo-Australians have only a partial knowledge of the country they inhabit, a country destined, perhaps, at some future period, to play as prominent a part in the history of the world as Great Britain itself. It would be futile to attempt a review of this work in any space we can at present allot to it. Suffice it to say, that we deem it one of the most important works of its class ever published. As a work of reference it will prove of great value, as it is thoroughly indexed, and also contains a glossary of mining terms, with plates illustrating scenery, also apparatus, implements, etc., used in the Australian mines. The entire work is, moreover, illustrated in a very artistic manner. The reader will find in another column an extract from this work, with an illustration of the "Welcome Stranger Nugget," found near Donolly in Australia, the largest mass of pure gold ever found native in the history of gold mining.

THE PROGRESS AND CONDITION OF SEVERAL DEPARTMENTS OF INDUSTRIAL CHEMISTRY. By J. Lawrence Smith, U. S. Commissioner to the Paris Universal Exposition, 1867.

This is one of the series of able and instructive reports which have been prepared and published on the great French Exposition. We have met with no similar document of greater interest and value than this, and we find in its perusal that we shall be able to select many extracts of interest which we shall in due time lay before our readers, premising that some of the deductions of the author in regard to the effect of legislation upon similar industries in the United States do not receive our sanction. An extract from this report, entitled "Applications and Progress of the Manufacture of Sulphuric Acid," will be found in another column, and is the first of several extracts we shall make upon this, and other important branches of manufacture.

USEFUL INFORMATION FOR RAILROAD MEN. Compiled for the Ramapo Wheel and Foundery Company by W. G. Hamilton, Engineer. Second Edition. Revised and Enlarged. New York: D. Van Nostrand, Publisher, 23 Murray street, and 27 Warren street.

This is a hand, or rather a pocket book of information in a condensed form, mainly compiled from the standard works of Clark, Colburn, Bourne, Haswell, Hurst, Molesworth, Nystrom, Percy, Scribner, Templeton, Ure, Price, and Williams, and is filled with useful and practical formulæ, rules, statistics, recipes, tables, etc., etc., thoroughly indexed, and provided with a rubber clasp. One of those books of reference most useful to practical men, and published in admirable style.

RAILWAY ECONOMY. Use of Counter-Pressure Steam in the Locomotive Engine as a Brake. By M. Le Chatelier, *Ingenieur en Chief Des Mines*. Translated from the Authors' Manuscript. By Lewis D. B. Gordon, F.R.S.E., Honorary Member of the Institution of Engineers in Scotland. Philadelphia: J. B. Lippincott & Co.

There is nothing new in the general idea of steam counter-pressure brakes. As practiced previous to the investigations and inventions of M. Le Chatelier, there were, however, insuperable objections to the employment of the system. These objections are fully set forth in the little work before us, as well as the progress of the experiments by which such an important modification of the system has been made, that, at the present date, upward of two thousand engines are running in France and Spain with this improvement attached, and it is also being introduced on the German railways. We have now in process of preparation an engraving of this improvement, and will give, in a future number, all necessary explanatory details in regard to it.

WE are in receipt of the first number of a neatly-printed quarto sheet called THE POLYTECHNIC, a semi-monthly of twelve pages, Montague L. Marks, editor and proprietor, 208 and 210 River street, Troy, N. Y. The prospectus informs us that the design is to establish this paper permanently as a high-class college scientific publication, to be increased both as to quantity and quality of its contents according to the amount of patronage it may receive. The connection of this paper with the Rensselaer Polytechnic Institute gives it command of many resources, both from the talent always to be found in that excellent school and from the alumini, among whom are many of our best engineers and scientific men. The first number is spirited and its contents are interesting. We wish our new cotemporary the success it merits. Subscription price $1 per annum.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

A valuable discovery of bismuth ore has been made near Balhannah, South Australia.

An alloy for jewelers' use, said to be very ductile and malleable and to possess a fine color, is composed of 750 parts of gold, 166 parts of silver, and 84 parts of copper.

During last year the quantity of silkworms' eggs exported from Japan amounted to 2,195,651 cards. Of this number 800,000 have been sent to France, Spain, Turkey, Persia, and other countries, and the remainder to Italy.

Dr. Poselger has determined by positive experiments that the death of trees growing along streets and promenades is not due, as has been often asserted, to the effects of the leakage in gas mains; but that it is owing chiefly to the neglect of so keeping the soil that air may freely permeate to the roots.

Abundant seams of coal of good quality have been discovered on the eastern shores of the Caspian Sea. Humboldt was of opinion that coal would be found there at no great depth, since the entire district abounds in naphtha. The steamships of that sea have hiterto employed wood as fuel, which had to be conveyed, at great cost, from the Ural mountains.

A number of submarine sweet water springs are known to exist in the Adriatic, along the coast of Istria and Dalmatia. As the maritime districts of these provinces suffer from want of a sufficient supply of water, and as it is possible by means of the Norton pump to save much that is now lost; the Austrian Minister of Agriculture has published a book on the means of finding and utilizing submarine fresh water springs on the Austrian coasts.

The Pacific railroads are now carrying emigrants to California for $70 from Philadelphia or $42 from Omaha. The number of emigrants since the 1st of September has averaged 100 per day. They are carried on the express freight train, and make the trip in less than ten days. A large increase of business is expected on this train next year.

Sir David Brewster found, says the *Engineer*, that the fundamental principle of the stereoscope was known to Euclid, who compiled the well known *Elements* about B. C. 280; that it was distinctly described by Galen, 1,500 years ago; and that Baptista Porta, in 1599, gave such a complete separate picture seen by each eye, and of the combined picture placed between them, in which we recognize not only the principle but the construction of the stereoscope.

M. Armand contributes a paper to the *Comptes Rendus* wherein he states that the deleterious effects of tobacco might be counteracted, if not entirely annihilated, by moistening the tobacco, while undergoing the various preparations and fermentations previous to its delivery to the consumer, with a strong infusion or other preparation of water-cresses. He has discovered that this vegetable contains principles which, while the peculiar aroma of tobacco will remain unaffected, will destroy the bad effects of nicotine.

The most remarkable railroad in Germany and Europe is the new Black Forest road, which will be completed within four years. Between Hornberg and St. George, situated 2,870 feet above the level of the sea, and but four miles distant from Hornberg, the railroad ascends nearly 2,000 feet, and passes through 27,000 feet of tunnels. Eleven thousand feet of the latter have been completed during the last two years. The truly Cyclopean work on the road is progressing rapidly, and attracting thousands of visitors, who flock together from all parts of Southern Germany and Switzerland.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HARROW.—P. S. Graves and P. B. Parcell, Ashmore, Ill.—This invention relates to a new and useful improvement in harrows, and consists in arranging the teeth in the harrow frame so that they may be simultaneously thrown backward or forward on either side.

APPARATUS FOR RAISING WATER.—Jas. W. Prendergast, New York city.—This invention relates to a new and useful method of raising water by atmospheric pressure.

SOLDERING MACHINE.—John G. Borden, Brewster Station, N. Y.—This invention relates to new and useful improvements in a machine for soldering tin cans and other articles of tin ware.

STEERING APPARATUS.—George H. Davis, Stony Brook, N. Y.—This invention relates to a new and useful improvement in apparatus for steering vessels on the water, and consists in constructing and arranging a chain pulley in such a manner that a chain may be effectively used in combination with a traversing wheel.

CAR COUPLING.—William Cottrell, Bordentown, N. J.—This invention relates to new and useful improvements in couplings for uniting railroad cars together; and it consists in a device for holding the coupling link in a horizontal position when the cars are being coupled, and in the method of inserting the coupling pin.

RAILROAD SUPPLY APPARATUS.—David Harrison, Fayette, Miss.—This invention has for its object to furnish a simple, convenient, and effective means for supplying a moving railroad train with water, fuel, etc., while under full headway.

FENCE.—Smith Riley, Kenton, Ohio.—This invention consists of sections made of longitudinal bars with beveled ends and vertical pickets, the said beveled ends of the sections being joined so as to assume a zig-zag form, and held together by connecting links extending from the picket with the end of one section to the corresponding picket of the next section.

TILE MACHINE.—George Jackson, Albany, N. Y.—This invention relates to certain improvements in tile machines, of that class in which the clay is by a sliding piston forced through apertures in the end of a box, so that it comes out in a continuous stream of the requisite cross section, to be cut into pieces of the desired length by a series of wires attached to a swinging frame.

SICKLE-BAR COUPLING FOR MOWERS AND REAPERS.—Rufus C. Wood, Le Roy, Kansas.—This invention has for its object to furnish an improved coupling for connecting the pitman and sickle bar of a reaper or mower to diminish the wear of the coupling pin and eye, and prevent the "end shake" of the sickle bar, and which shall at the same time be simple in construction and easily attached.

CLOTH-THINNING MACHINE.—J. W. Burch, Fayette, Miss.—This invention comprises an arrangement of devices for operating either a rotary cutter of three or any other preferred number of curved blades projecting from a disk, revolving transversely of the row, or a vibratory cutter working back and forth above the row, the whole mounted on a suitable frame and wheels, and deriving motion from the axle of the said wheels by suitabe gearing.

PRESS.—John Berkley, Washington, Texas.—This invention relates t improvements in presses for cotton, hay, and similar substances designed to provide a portable press of simple and cheap construction, mounted on wheels, for moving it from place to place, and arranged for adjusting the case in a vertical position for filling, and in a horizontal position for pressing, the follower being also arranged to work in a horizontal position.

CHURN DASHER.—Gustav Radbruch, Hoboken, N. J.—This invention relates to a new churn, of that class known as atmospheric churns, and consists of a new dasher, so constructed that it will at once agitate the cream and supply the necessary air by simple means.

RUFFLING ATTACHMENT TO SEWING MACHINES.—Louis H. Gunnerman Pittsburgh, Pa.—This invention relates to a new apparatus for ruffling or wrinkling fabric, and for attaching the same to straight fabric; and the in vention consists in the arrangement and combination of two plates, by which the two fabrics will be properly gaged and separated before they are sewed together.

CHAIR.—Allen Lapham, Paterson, N. J.—This invention has for its object to improve the construction of chairs, so as to make them stronger, more durable, and less liable to become loose and shaky than when constructed in the ordinary manner.

GANG PLOWS.—H. N. Dalton, Pacheco, Cal.—This invention has for its object to improve the construction of gang plows, in such a way that the gang plow may be raised while running to cut a light furrow, or to lift it entirely from the ground at the will of the operator, and which shall be simple in construction and readily applied and operated.

KEROSENE LAMP BURNERS.—Edward L. Gilman, Somerville, Mass.—This invention has for its object to improve the construction of kerosene lamp burners, so that the gas arising from the oil or fluid mingled with air may be conducted to the flame to increase the light.

PORTABLE FIRE ESCAPE.—Hugh C. Carrigan, New York city.—This invention has for its object to furnish an improved portable fire escape, designed to be kept by those occupying upper apartments, in their rooms; and which shall be so constructed and arranged, that it will enable the occupants of the rooms to lower their property and themselves with speed and convenience to the ground, and which, when not in use, will present the appearance of being nothing but an ordinary chair and may be used as such.

WATER REGULATOR, ALARM, AND INDICATOR FOR STEAM BOILERS.—Leopold Steigert, Cincinnati, Ohio.—This invention consists of the arrangement of a float in a vessel, attached to the side of the boiler in a manner to oscillate a shaft carrying indicators and actuating a whistle valve, and a plug in the supply pipe whereby the whistle may be caused to blow at the proper time, and the water is allowed to flow to the pump where required, or shut off when not needed.

HAY LOADER.—J. C. Leonard, S. B. Holcomb, and W. B. Wight, Clinton, Mo.—This invention consists in a rake and elevating apparatus, mounted on two wheel to be hitched to the rear end of the wagon and arranged to gather the hay in front of the fixed curved teeth of the rake, from which it is taken by the elevator and delivered to the wagon in a peculiar manner.

WATER REGULATOR AND ALARM.—James William Ebert and Eli C. McCloy, Zanesville, Ohio.—This invention comprises an arrangement of valves in the feed water supply pipe for the pump, connected with a float and bung inside the boiler, so as to open and close the passage, as required; also, in connection with the said valves, another set of valves in the steam pipe leading to the whistle, which, when the water supply fails will give the alarm.

VELOCIPEDE.—Theodore Searing, New York city.—This invention consists, first, in a peculiar arrangement of runner and brake attachment for the wheels, and second, in an attachment to the propelling cranks of a pair of vibrators, to which are attached spiked segmental bars by pivot joints, under an arrangement whereby the spikes will be caused to engage with the ground when moved in the direction for propelling, but will slip over it without engaging when moving in the opposite direction.

FLYING MACHINE.—W. F. Quinby, Wilmington, Del.—This invention relates to improvements in flying apparatus intended to provide an arrangement of temporary sails, resembling in some respects the wings of birds in their construction and operation, which may be readily connected to the body of a person by means of a cuirass fitted to the body and made of metallic strips, formed and adapted to assist the operator to support the wings and at the same time to shield him from the shocks and jars due to the operation of the wings.

GOVERNOR FOR STEAM AND OTHER ENGINES.—W. J. Kesselmeyer, C. A. Kesselmeyer, Manchester, England, and E. H. Nacke, Als-Shoenfeld, Saxony.—This invention has for its object to render centrifugal governors more perfect in regulating the speed of the engine, so that the speed will be immediately corrected, as soon as it shall vary. The invention consists in the application to the movable valve rod of a vessel containing liquid matter, and in connecting the same with a stationary vessel in such a manner that, when by the contraction of the governor balls, the movable vessel is lowered, the liquid will flow into it from the reservoir, causing it to sink and to open the valve without loss of time.

WATER VELOCIPEDE.—F. A. Spofford and M. G. Raffington, Columbus, Ohio.—This invention relates to a new mechanism for propelling water craft by muscular power and by the aid of levers, ratchet wheels, etc., applied to paddle wheels.

CHOCOLATE PASTE.—L. F. Leger, New York city.—The object of this invention is to so prepare chocolate that it can be preserved in a semi-liquid state, to be readily dissolved when required.

IRON DOUBLE SHOVEL PLOW.—C. I. Voigt, West Salem, Ill.—This invention has for its object to furnish an improved double shovel iron plow or cultivator, which shall be simple in construction, easily adjusted, effective in operation, and easily operated.

MANUFACTURING AND REFINING SUGAR.—Louis J. F. Margueritte, Paris, France.—This invention consists in manufacturing and refining sugar by the following mode of operation: The sugar mixed with molasses is first brought in contact with a certain quantity of wood spirit in a mixer, where the whole is stirred for a very short time. The mixture consisting of sugar and liquid is then passed to a filter similar to those containing animal charcoal, when the black liquor of the molasses is run off, which is afterward replaced by pure wood spirit. A washing effected in this manner by displacement furnishes a perfectly white sugar.

HAY RAKER AND LOADER.—N. Farlow and J. A. Ham, Sullivan, Ill.—This invention relates to improvements in apparatus for raking hay and elevating it to a pitching platform, all suspended from a pair of wheels to be hitched to and drawn by the wagon to be loaded, or, when used for gathering grain for binding, to be drawn by a horse; the invention consisting in certain arrangements of the parts.

HAY DERRICK.—Winfield Denton, Iowa City, Iowa.—This invention relates to a new and useful improvement in derricks for loading hay.

CAR COUPLING.—Michael Connelly, Baltimore, Md.—The object of this invention is to provide for public use a simple and effective automatic coup ing for railroad cars.

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MACHINE FOR SAWING KINDLING WOOD.—W. A. Allen, Baltimore, Md.—This invention relates to that class of sawing machines in which several circular saws are employed, in connection with endless chains and knees, for carrying the logs.

CIDER PRESS.—John J. Shaffer and Emanuel Stoner, Westminster, Md.—This invention relates to a press, in which the follower slides up and down upon vertical rods, passing through it, one near each of its ends.

FARM GATE.—Daniel Shockey, Waynesborough, Pa.—The object of this invention is to provide for public use a neat, light, simple, and strong gate, for use upon farms, etc., and which can be conveniently opened or closed from either side.

FIRE GRATE.—Asa Snyder, Richmond, Va.—This invention consists of a basket grate and concave perforated radiator, placed in such relation to the chimney and jambs as to leave an air space between the grate and the chimney and jambs, said air-space being, in fact, a continuation downward of the smoke flue of the chimney, and being seperated from such smoke flue by a damper placed between the radiator and the chimney for the purpose of creating a rapid draft through the air-space, and carrying off the debris dislodged by raking the fire.

"FIXING" OR REPAIRING PUDLING FURNACES.—Morgan Z. Evans, Ormsby Post office, Pa.—This invention relates to puddling and boiling furnaces, and applies in the process called by furnacemen "fixing," which is performed as occasion may require, in the way of repairs.

REAPING AND MOWING MACHINES.—T. H. Taylor, Jeffersonville, Ill.—This invention relates to improvements in reaping and mowing machines designed to provide an improved arrangement for operating the cutter bars; also, an improved arrangement of the cutter and cutter supporting bars.

KNIFE GUARD.—E. A. Goodes, Philadelphia, Pa.—The invention consists of a wire-guard attachment, so shaped and arranged relatively to the knife blade, that it may be readily clamped to the blade by thumb nuts, screwing on to the ends of the wire and against the back edge of the blade, with the gaging part adjusted along the edge, at one side, parallel with it, and the required distance for the thickness of the paring from it.

HORSE-POWER.—Diffendall & Hughes, Westminster, Md.—The object of this invention is to provide a simple and compact arrangement of multiplying wheels in a portable horse-power, for producing a rapid motion for the tumbling shaft, from the first mover, with the least possible amount of lateral pressure on the driving shaft.

LIFE, SURF, AND OTHER BOATS.—Henry Thompson, Mobile, Ala.—The object of this invention is to provide new and useful improvements in small boats, to render them safe and efficient as life, surf, or pleasure boats. Also, to provide improvements in propelling apparatus, calculated to apply the same to better advantage than in the common way. Also, to provide an an arrangement of the paddlewheels and wheel guards, to facilitate the transportation of the said boats on land. Also, to provide an arrangement of pumping devices, which may be used either for pumping water from the hold, or for drawing water over the side, for playing upon fires, or for other purposes.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

A. H. B., of Pa.—A body floating in a fluid medium, and sustaining by its buoyancy just as much weight as it is capable of supporting, would descend through that medium by the addition of just sufficient weight to overcome the friction of the fluid against its sides. It will then certainly take *as much* (practically more) weight to draw it down through that fluid as it can raise by its buoyancy. In the answer to the correspondent about the balloon, the endeavor was to make this point clear, and to show that a balloon in rising could exert no more force (practically not so much) than would be required to pull it down again.

W. A. H., of Tenn.—The plan of closing a well air tight at its mouth and inserting a pipe to reach below the surface of the contained water, and raising the water by forcing air into the well will work in some cases, but it is neither new, patentable, nor practicable. Because the top of a wheel rolling along a level surface moves faster ahead relatively to any point on that surface than the bottom, it does not follow that its circumferential motion is greater at the top than at the bottom. What we mean by circumferential motion, is the motion of all points in the circumference around the axis of the wheel.

J. A., of Ill.—The photographer has the best of it. The contraction of the pupil of the eye does not diminish the apparent size of external objects. The reason of the apparently larger size of the sun and moon when near the horizon is probably that they are then in immediate contrast with terrestrial objects, by which their size is estimated, while in the zenith no such standard of comparison can be simultaneously viewed with them.

B. J. J., of Va.—We would not recommend the arrangement of piping for a lumber drying-house you propose. "A Practical Treatise on Heat," published by Henry Carey Baird, of Philadelphia, will instruct you properly on this subject. There ought to be good ventilation in any room used for drying purposes. Your last question cannot be answered in the form you put it.

J. B. W., of Pa.—Your suggestions for ventilating mines by forcing air down through a main pipe by steam power, and delivering it through branch pipes, contain nothing new. This is, however, a good plan, and it, or its equivalent, has been tried successfully in English coal mines. We agree with you that either this or some other equally effective system ought to be generally adopted in working coal mines.

J. W. P., of Me.—The best material for a step to a turbine wheel is probably lignum vitæ. That your steps burn out indicates that the wheel is not balanced properly to take off its weight from the step. If it is not practicable to balance it in this way your only remedy will be to increase the size of the bearing in proportion to the weight of the wheel.

G. M. S., of Miss.—The power of an engine having a twenty-inch stroke would be to one having a thirty-inch stroke, everything else being equal and the steam being worked non-expansively, as one to two. This, of course, supposes everything so arranged that the mean effective pressure in the cylinders should be the same throughout their respective strokes.

F. C. B., of Ohio.—To scale sheet steel, use a wooden trough lined with sheet lead. Use crude sulphuric acid, one part of acid to ten of water, by measure, or rather more dilute, let the sheets remain only a very short time in the bath, take them out and wash them in hot lime water, and then rub them with clean dry saw dust or chaff.

W. Z., of La.—The appearance of gold, copper, or brass, is given to tin plate by the application of suitable lackers. You can purchase these lackers at dealers in varnishes, etc.

F. D. H., of N. Y.—You can dissolve rubber in naphtha to a thick solution and with it stop small holes in rubber. Apply it soft and allow it to harden thoroughly.

G. G. B., of N. H.—The mineral specimen seems a schist containing iron. It appears to be of no value, but analysis might give a different result.

J. D. P., of N. Y.—The broad gage railways are failures only because they are, for various reasons, so expensive in their operation. We can not enter at this time into a detailed account of these causes, They are good for the passengers but hard on the companies who own them.

M. G., of Minn.—Your sketch is very imperfect, but from what we can understand of it, it shows no patentable improvement. It would, therefore, be scarcely worth while to enter into the computation necessary to determine what strain such a structure would sustain.

S. E. W., of N. Y.—Friction would be reduced in using friction rollers under your shaft in proportion to the diminished surfaces of the journals. The size must depend upon the circumstances of the case. Make the rollers as large as you can conveniently.

C. T. G., of Pa.—It would be impossible to give you the knowledge you require in the form of a recipe. A small volume called "The Complete Practical Brewer," published by Henry Carey Baird, of Philadelphia, gives the precise information you require.

J. M. H., of Wis.—We know of no steam apparatus which will meet your requirements and which you can purchase ready made You might, it seems to us, easily devise one for yourself. Set your wits t work.

R. S. B., of Ky.—The minerals you send appear to contain iron and perhaps copper, with sulphur and arsenic. We cannot determine whether other metals of value are present without making an assay.

M. S. M., of Mo.—The stones you send are agate and chalcedony. They have little value except when worked and polished. They are rendered valuable according to the labor bestowed upon them.

E. H. S., of N. H.—You will find an article fully treating your question about long and short screw drivers in the SCIENTIFIC AMERICAN, Vol. XVIII, No, 25, page 393, June 20, 1868.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

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Just what you have been looking for. We build all kinds of experimental machinery and models on short notice and reasonable terms. Henry & Co., 125 Eldridge st., New York.

Wanted—By a man of first-class experience, a situation as electro bright and dead plater and gilder. Good reference. Address H. E. Osborn, Postoffice Box 151, West Meriden, Conn.

A thorough sewing machinist desires employment. Address James R. Ellis, Baltimore, Md.

If you want the real oak-tanned leather-belting, C. W. Arny manufactures it. See advertisement.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

You can get your patent articles manufactured quick and cheap at Henry & Co.'s, 125 Eldridge st., New York.

Every wheelright and blacksmith should have one of Dinsmore's tire shrinkers. Price $40. R. H. Allen & Co., P.O. Box 376, New York.

Wanted—A practical machinist and draftsman wants a stiuation as draftsman. Best recommendation can be given. Address Eugen Walther, 638 Callowhill st., Philadelphia.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Chemicals, Drugs, Minerals, Metals, Acids, etc., for all Mechanics and Manufacturers, for sale by L. & J. W. Feuchtwanger, Chemists, and Importers of Drugs and Minerals, 55 Cedar st., New York.

Who wants a good 15-in. swing Engine Lathe, address Star Tool Co., Providence, R. I.

For Sale—A valuable pat. for a composition for covering boilers, steam pipes, etc., E. D. & W. A. French, 3d & Vine sts., Camden, N. J.

Cradle-finger Machine wanted by Smith & Montross, Galien, Mich.

Wanted—A set of the best new machinery for converting standing trees into short, split firewood. W. H. H. Green, Jackson, Miss

Clothes Wringers of all kinds repaired or taken in part pay for the "Universal," which is warranted durable. R. C. Browning, Agent, 32 Courtlandt st., New York.

For Sale—Cotton Planter.—The entire right of the King Cotton Planter—the only successful in use. Have been worked since the war, and given universal satisfaction. The machine is simple, strong, and can be built cheaply. Will sell at a low figure. Reason for disposing of it is want of time to give it proper attention. Address S. N. Brown & Co., Dayton, O.

Hot Pressed Wrought Iron Nuts, of all sizes, manufactured and for sale at moderate prices by J. H. Sternbergh, Reading, Pa.

Vols., Nos., and Sets of Scientific American for sale. Address Theo. Tusch, No. 37 Park Row, New York city.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Man'f'rs of grain-cleaning machinery and others can have sheet zinc perforated at 2c. per sq. ft. R. Aitchison & Co., 845 State st., Chicago

Send for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash, fire and water-proof. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Leschot's Patent Diamond-pointed Steam Drills save, on the average, fifty per cent of the cost of rock drilling. Manufactured only by Severance & Holt, 16 Wall st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of the Parker Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

Facts for the Ladies.

I have one of the Wheeler & Wilson Sewing Machines, which has been in constant use for the past fifteen (15) years. It has never been repaired, and to-day is in perfect order, and is equal, for all kinds of work, to any machine I have yet seen. It has been used in making heavy clothing, besides doing all manner of family sewing, and I think it gets better every day.

MRS. JOAB SCALES.

Toronto, Ontario.

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Issued by the United States Patent Office.

FOR THE WEEK ENDING OCT. 5, 1869.

Reported Officially for the Scientific American

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Patent Solicitors, No. 37 Park Row, New York.

95,405.—COMPOSITION FOR MAKING TYPES FOR PRINTING WALL PAPER, OILCLOTH, AND OTHER FABRICS.—R. A. Adams, New York city.
95,406.—SAWING MACHINE.—W. A. Allen, Baltimore, Md.
95,407.—MEDICAL COMPOUND OR CORDIAL.—Joseph Ambrose, Nashville, Tenn.
95,408.—HAY LOADER.—Isaac Anderson, Poland, Ohio.
95,409.—BINDING GUIDE FOR SEWING MACHINE.—E. F. Angell, Chicago, Ill.
95,410.—HAMES FASTENER.—H. W. Austin and E. C. Perry, Portage township; Edwin C. Perry, assignor to G. T. Nash, Kalamazoo Mich.
95,411.—COTTON PRESS.—Augustine Baldwin, New York city. Antedated Sept. 22, 1869.
95,412.—APPARATUS FOR CARBURETING AIR AND GAS.—Arthur Barbarin, New Orleans, La.
95,413.—DEVICE FOR STEAMING ROVINGS.—Solomon Barber, South Coventry, Conn.
95,414.—BAND CUTTER.—W. C. Barr and E. J. Hunkins, Macon City, Mo.; said Hunkins assignor to said Barr for his right. Antedated Sept. 22, 1869.
95,415.—WASHING MACHINE.—B. B. Beers and Nathan Couch, New Fairfield, Conn.
95,416.—HAY AND COTTON PRESS.—John Berkeley, Washington, Texas.
95 417.—SHAFT COUPLING FOR CARRIAGES.—Albert Betteley, Boston, Mass.
95,418.—MACHINE FOR SOLDERING TIN CANS.—J. G. Borden, Brewster Station, N. Y.
95,419.—PURIFYING IRON AND STEEL, OR OTHER METAL.—Edward Brady, Philadelphia, Pa.
95,420.—RIM PRESS AND TIRE HEATER.—J. H. Britton, Painesville, Ohio.
95,421.—TABLE SLIDE.—Aaron Brower (assignor to himself and C. S. Hall), Rochester, N. Y. Antedated Sept. 18, 1869.
95,422.—COTTON-THINNING MACHINE.—I. W. Burch, Fayette Miss.
95,423.—THRASHING MACHINE.—Duncan Campbell, Indian Town, Ill.
95,424.—SAFETY PIN FOR SECURING CLOTHING.—Frederick Catlin, New York city.
95,425.—DYERS' VAT.—H. Champenois, New York city.
95,426.—ATTACHMENT FOR WINDOW SASH CORDS.—S. N. Chapin, New Britain, Conn.
95,427.—STUMP EXTRACTOR.—Daniel S. Chapman, Conneaut, Ohio.
95,428.—REFRIGERATOR.—A. J. Chase (assignor to B. F. Horn), Boston, Mass.
95,429.—COOKING STOVE.—B. F. Clement (assignor to C. H. Buck and W. S. Wright), St. Louis, Mo.
95,430.—HAMES FASTENER.—J. Clendening, Rockford, Ill.
95,431.—RAILWAY CAR COUPLING.—Michael Connelly (assignor to himself and H. W. Rogers), Baltimore, Md.
95,432.—HERNIA TRUSS.—D. J. Cooper, New Orleans, La.
95,433.—TRUSS AND SUPPORTER.—D. J. Cooper, New Orleans, La.
95,434.—RAILWAY CAR COUPLING.—Wm. Cottrell (assignor to himself and F. G. Wiese), Bordentown, N. J.
95,435.—LATHING MACHINE.—George N. Creamer, Trenton, N. J.
95,436.—BEEHIVE.—L. H. Critchfield, Shreeve, Ohio.
95,437.—SPRING FOR GANG PLOWS.—H. N. Dalton, Pacheco, Cal.
95,438.—WRENCH.—A. B. Davis, Pleasantville, Pa.
95,439.—HAY DERRICK.—Winfield Denton, Iowa City, Iowa.
95,440.—HORSE POWER.—Joseph Diffendal and S. Hughes, Westminster, Md.
95,441.—METHOD OF FORMING MOLDINGS.—Joseph Dill and E. Rice, Grand Rapids, Mich.
95,442.—BAND FOR BOOMS AND GAFFS.—David Dryburgh, Philadelphia, Pa. Antedated Sept. 20, 1869.
95,443.—RAILROAD SPIKE.—P. J. Dwyer, Elizabethport, N. J.
95,444.—BOILER FEEDER ALARM DEVICE.—J. W. Ebert and E. C. McCloy, Zanesville, Ohio.
95,445.—APPARATUS FOR EVAPORATING AND DECOMPOSING LIQUIDS.—Albert Eckstein (assignor to "Zdenks Ritter Von Wessely"), Vienna, Austria.
95,446.—TURN TABLE.—L. W. Emmart and E. D. Griffith, Washington, D. C.
95,447.—BALING PRESS.—C. J. Emmett, New York city.
95,448.—HOISTING MACHINE.—Wm. Eppelsheimer (assignor to himself and E. A. Trapp), San Francisco, Cal.
95,449.—SNOW PLOW.—C. L. Ericzon, Salt Lake, Utah Territory.
95,450.—FIXING PUDDLING AND BOILING FURNACES.—M. Z Evans, Ormsby, Pa. Antedated Oct. 1, 1869.
95,451.—HAY RAKER AND LOADER.—Newton Farlow and J. A. Ham, Sullivan, Ill.
95,452.—DEVICE FOR SUPPORTING THE SHAFTS OF VEHICLES.—Rubin Fink and Reuben Daveler, Lancaster, Pa.
95,453.—WHEELED CULTIVATOR AND PLOW.—Sam'l Fisher, Hightstown, N. J.
95,454.—SAUSAGE STUFFER.—Charles Forschner, New York city.
95,455.—TOY TOP.—Henry Foulkes, Utica, N. Y.
95,456.—BEARING FOR SPINDLES IN SPINNING MACHINES.—J. B. Fuller, Norwich, Conn. Antedated Sept. 16, 1869.
95,457.—ATTACHING HANDLES TO CUTLERY.—J. W. Gardner (assignor to "Lamson and Goodnow Manufacturing Co."), Shelburne Falls, Mass.
95,458.—HARROW.—D. L. Garver, Hart township, Mich.
95,459.—MANUFACTURE OF COAL GAS.—Wm. Gibson, Cambridge, Mass.
95,460.—LAMP BURNER.—E. L. Gilman (assignor to himself and F. Houghton), Somerville, Mass.
95,461.—HOT-AIR FURNACE.—B. Gommenginger and C. W. Trotter, Rochester, N. Y.
95,462.—MACHINE FOR DRAWING FLAX, ETC.—John Good, Brooklyn, E. D., N. Y.
95,463.—KNIFE GUARD.—E. A. Goodes (assignor to the Philadelphia Patent and Novelty Co.), Philadelphia, Pa.
95,464.—WASH BOILER.—S. A. Goodwin, Buffalo, N. Y.
95,465.—PROCESS OF PREPARING ALIZARINE.—Chas. Graeb, Frankfort-on-the-Main, and Charles Liebermann, Berlin, Prussia.
95,466.—CARRIAGE SEAT.—S. P. Graham, Columbus, Ohio.
95,467.—HARROW.—P. S. Graves and P. B. Parcell, Ashmore Ill.

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95,468.—CLEANING BRUSH FOR ORDNANCE.—John Tyndale Greenfield, Dover, England.
95,469.—RUFFLING ATTACHMENT FOR SEWING MACHINES.—Louis H. Gunnerman (assignor to himself and William G. Hoover), Pittsburgh, Pa.
95,470.—SHOE KNIFE.—M. E. Hall, Spring, Pa.
95,471.—RAILWAY.—David Harrison, Fayette, Miss.
95,472.—APPARATUS FOR SEPARATING GOLD FROM SAND.—D. F. Hawkes, Timbuctoo, Cal.
95,473.—PROCESS OF SEASONING WOOD.—T. W. Heinemann, New York city.
95,474.—PROCESS AND APPARATUS FOR PRESERVING WOOD.—T. W. Heinemann, New York city.
95,475.—PRESS FOR MAKING COFFIN TOPS.—A. W. Hendrick, Batavia, Ill.
95,476.—VALVE DEVICE FOR STEAM AND OTHER ENGINERY.—E. H. Hewins, Boston, Mass.
95,477.—MILK AND PROVISION SAFE.—William Hinman, Elkhart, Ind.
95,478.—CIGAR MACHINE.—J. C. Hintz, Cincinnati, Ohio.
95,479.—TILE MACHINE.—George Jackson, Albany, N. Y.
95,480.—MACHINE FOR CUTTING TAPERS.—Clark Jillson, Worcester, Mass.
95,481.—GOVERNOR FOR STEAM AND OTHER ENGINERY.—W. J. Kesselmeyer and C. A. Kesselmeyer, Manchester, England, and E. H. Nacke, Ais-Schoenfeld, Saxony.
95,482.—WHIP HOLDER.—A. W. Johnson, New York city.
95,483.—BORING TOOL.—W. J. Johnson, Newton, and George Tainter, Watertown, Mass.
95,484.—MANUFACTURE OF WHITE OXIDE OF ZINC.—Richard Jones, Mount Holly, N. J.
95,485.—HULLING MACHINE.—C. H. Keniston, Somerville, and J. H. Sawyer (assignors to J. T. Prince), Boston, Mass.
95,486.—STEAM ENGINE.—Alden Kilby, Boston, Mass.
95,487.—PLOW.—Henry Killam, Mendon, Mich.
95,488.—CARRIAGE-AXLE CONNECTION.—J. W. Kingsbury, New Bedford, Mass.
95,489.—DOLL.—Martin Kintzback, Philadelphia, Pa.
95,490.—SAWING MACHINE.—R. M. Lafferty (assignor to himself and J. E. & J. P. Prutzman), Three Rivers, Mich.
95,491.—CHAIR.—Allen Lapham, Paterson, N. J.
95,492.—CHOCOLATE PASTE.—L. F. Leger, New York city.
95,493.—HAY RAKER AND LOADER.—J. C. Leonard, S. B. Holcomb, and W. B. Wright, Clinton, Mo.
95,494.—MARINE PAINT.—W. H. Lewis, assignor to himself and J. B. Folger, Boston, Mass.
95,495.—COMBINED TRY-SQUARE, CALLIPER, ETC.—W. J. Linton, Detroit, Mich. Antedated Sept. 20, 1869.
95,496.—MANUFACTURE AND REFINING OF SUGAR.—Louis J. F. Marguerite, Paris, France. Patented in France, October 16, 1867.
95,497.—CAR SPRING.—J. R. Mathews, New London, Conn.
95,498.—LOCOMOTIVE HEAD-LIGHT.—H. S. Maxim and James Radley, New York city.
95,499.—SEWING MACHINE.—T. L. Malone, Mount Gilead, Ohio.
95,500.—MANUFACTURING GERMAN HAND-CHEESE.—F. C. Mende and T. F. Mende, Philadelphia, Pa.
95,501.—COOKING STOVE.—B. H. Menke, Cincinnati, Ohio.
95,502.—Suspended.
95,503.—WATER GAGE.—George Murray, Jr., Cambridgeport, Mass.
95,504.—DEVICE FOR HOLDING TOGETHER THE DIFFERENT PARTS OF BUREAUS AND OTHER ARTICLES OF FURNITURE.—J. O. L. Murray and D. A. Mullane, New Orleans, La.
95,505.—CULTIVATOR.—A. S. Perrigo, Sandwich, Ill.
95,506.—COMBINED LATCH AND LOCK.—N. Petre, New York city.
95,507.—COMBINED LATCH AND LOCK.—N. Petre, New York city.
95,508.—LATCH.—N. Petre, New York city.
95,509.—LOCK.—N. Petre, New York city.
95,510.—HOT-AIR REGISTER.—H. M. Phinney, Cambridge, Mass.
95,511.—WINDOW BLIND.—Anthony Pirz and Manuel Pirz, East New York, N. Y.
95,512.—AIR-PRESSURE WATER RESERVOIR.—J. W. Prendergast, New York city.
95,513.—FLYING MACHINE.—W. F. Quinby, Wilmington, Del.
95,514.—CHURN DASHER.—Gustav Radbruch, Hoboken, N. J.
95,515.—VELOCIPEDE.—John Reinhart, (assignor to Andrew Christian), New York city.
95,516.—MACHINE FOR MAKING AND WRAPPING WEBBING BOOT STRAPS.—J. W. Richardson, South Braintree, Mass.
95,517.—COMPOSITION FOR COVERING STEAM BOILERS, ETC.—John Riley and C. W. Bissel, Troy, N. Y., assignors to C. W. Bissell, Terrance Riley, and Mary C. Frazer.
95,518.—FENCE.—Smith Riley, Kenton, Ohio.
95,519.—STAGING FOR ROOFS.—W. B. Ross, Keene, N. H.
95,520.—CULTIVATOR.—S. A. Sabin, Pecatonica, Ill.
95,521.—SLEIGH-ATTACHMENT FOR VELOCIPEDES.—Theodore Searing, New York city.
95,522.—HARVESTER.—Allen Sherwood, Auburn, N. Y.
95,523.—MANURE DRAG.—A. H. Shock and H. R. Shirk, Lancaster, Pa.
95,524.—FARM GATE.—Daniel Shockey, Waynesborough, Pa.
95,525.—MODE OF ATTACHING TRIMMING TO ARTICLES OF DRESS.—John Sims, Liverpool Road, England, assignor to Wm. Sparks Thompson.
95,526.—HARVESTER.—Wm. P. Slack, Lewisburg, Pa.
95,527.—MANUFACTURE OF SOAP FOR MEDICINAL AND FOR OTHER PURPOSES.—Lebbeus W. Smith, Boston, Mass. Antedated September 18, 1869.
95,528.—PIPE COUPLING.—Thomas Smith, Baltimore, Md.
95,529.—FIREPLACE.—Asa Snyder, Richmond, Va.
95,530.—CRADLE.—Augustus Spiegel, Indianapolis, Ind.
95,531.—WATER VELOCIPEDE.—Fisher A. Spofford and Matthew G. Raffington, Columbus, Ohio.
95,532.—STEAM GENERATOR.—Samuel Stanton, Newburg, N. Y.
95,533.—BOILER WATER REGULATOR AND ALARM.—Leopold Steigert, Cincinnati, Ohio.
95,534.—MANUFACTURE OF PIGMENTS FOR PAINTS.—Robert S. Stenton, New York city.
95,535.—SEED DRILL.—S. Stow, East Enterprise, Ind.
95,536.—ORGAN AND MELODEON.—Simeon Taylor, Worcester, Mass.
95,537.—HARVESTER.—T. H. Taylor, Jeffersonville, Ill.
95,538.—LIFE BOAT.—Henry Thompson, Mobile, Ala.
95,539.—GANG PLOW.—J. N. Thompson and Wm. Kenady, Belpassi, assignors to D. W. Frary, Portland, Oregon.
95,540.—AUTOMATIC PASSENGER REGISTER.—H. H. Trenor, New York city.
95,541.—DOUBLE SHOVEL PLOW.—Charles Immanuel Voigt, West Salem Ill.
95,542.—BATH-TUB EDUCTION TUBE.—William. H. Walton, Philadelphia, Pa.
95,543.—STEAM ENGINE GOVERNOR.—William Wickersham, Boston, Mass.
95,544.—CHAIR, CRADLE, COT, ETC.—John T. Wightman, Charleston, S. C.
95,545.—WATER ELEVATOR.—J. W. Wheeler, Cleveland, Ohio.
95,546.—RAILWAY CAR COUPLING.—J. C. Wilson, Appleton, Wis.
95,547.—WATCH.—Charles V. Woerd, Waltham, Mass.
95,548.—PITMAN-CONNECTION FOR HARVESTERS.—Rufus C. Wood, Le Roy, Kansas.
95,549.—HORSE POWER.—Daniel Woodbury, Rochester, N. Y.
95,550.—FURNACE DOOR FRAME.—David H. Young, Manchester, N. H.
95,551.—STOVE DRUM.—Wm. Allchin, Newburg, N. Y.
95,552.—WASHING MACHINE AND TABLE.—Daniel Arndt, Toledo, Ohio.
95,553.—SPRING FOR BED BOTTOMS.—Lyman M. Bates, Jackson, Mich.
95,554.—MANUFACTURE OF SHEET IRON.—Silas Barker, Hartford, Conn.
95,555.—RAILWAY-RAIL CHAIR.—Robert C. Blackall, Albany, N. Y.
95,556.—GRAIN DRYER.—Wm. Blakey, Baltimore, Md.
95,557.—GRINDING MILL.—Righter W. Bowman, Orangeville, Pa.
95,558.—CIDER PRESS.—Asa Brooks, Tolland, Conn.
95,559.—WAGON TONGUE HOLDER.—Orlando F. Bryant, Carver Minn.
95,560.—CHURN.—Francis Burdick, South East, N. Y., and Lodowick Burdick, Lockhaven, Pa
95,561.—COMBINED STRAW-CUTTER AND FEED BOX.—Jesse Burgess, Richmond, Ind.
95,562.—REFRIGERATOR.—Morgan Burton, Darlington, Pa.
95,563.—COTTON PRESS.—C. A. Caldwell, Concord, N. C.
95,564.—SPRING-BED BOTTOM.—Charles L. Chadeayne, Yonkers, N. Y.
95,565.—WASHING MACHINE.—E. Hall Covel, New York city.
95,566.—POST AUGER.—Z. S. Cracraft, Lacon, Ill.
95,567.—WASHING MACHINE.—John Crampton and Wm. H. Pangborn, Plainfield, N. J.
95,568.—MANUFACTURE OF IRON AND STEEL.—Norman Cutter, Cincinnati, Ohio, and Elliot Savage, West Meriden, Conn.
95,569.—ROCK DRILL.—Charlton H. Davis, San Francisco, Cal.
95,570.—CAR COUPLING.—Calvin R. Densmore and Jacob A. Vrooman, Oil City, Pa.
95,571.—SEWING MACHINE FOR BOOTS AND SHOES.—Auguste Destouy) assignor to Charles Goodyear, Jr.), New York city.
95,572.—TABLE CASTER.—Henry A. Dirkes, New York city.
95,573.—WASHING MACHINE.—Charles F. Dodge, New York city
95,574.—PROCESS OF DISTILLING SPIRITS.—Joshua Ellingwood, Owensborough Ky.
95,575.—LAMP-SHADE SUPPORTER.—Charles W. Emerson (assignor to himself and John C. Abbott), Hartford, Conn.
95,576.—FABRIC FOR ROOFING AND FOR OTHER PURPOSES.—Benjamin F. Field, Beloit, Wis., and Robert D. O. Smith, Washington, D. C., assignors to Benjamin F. Field.
95,577.—MANUFACTURE OF ANVILS, AND THE TOP AND BOTTOM PARTS OF HAMMERS, ETC.—David Foster, Sheffield, England. Patented in England, June 4, 1868.
95,578.—APPARATUS FOR TRANSMITTING POWER.—Arthur L. Freeman, South Boston, Mass.
95,579.—PLATFORM FOR RAILWAY CAR.—Joseph Gilmer, Monticello, Fla.
95,580.—MACHINE FOR DRAWING AND SPINNING WOOL, ETC., FROM THE CARDING MACHINE.—John Goulding, Worcester, Mass.
95,581.—SEWING MACHINE.—Joshua Gray, New York city.
95,582.—MACHINE FOR SAWING LATH.—Wm. P. Hale, Ionia, Mich.
95,583.—PROCESS OF TREATING WOOD, TO PRESERVE, SEASON, AND GIVE IT A BETTER SURFACE.—Ira Hayford and Joseph F. Paul, Boston, Mass.
95,584.—MACHINE FOR STEAMING AND SHRINKING CLOTH.—Wm. Hebdon, New York city.
95,585.—MACHINE FOR BENDING FIFTH-WHEELS.—Geo. W. Heckart, New Lisbon, Ohio.
95,586.—MECHANICAL MOVEMENT.—William M. Henderson, Philadelphia, Pa.
95,587.—Suspended.
95,588.—SPRING SCALE.—Simon Ingersoll, Brooklyn, N. Y.
95,589.—STAIR ROD.—Hans Iversen and Daniel Acker, New York city.
95,590.—WAGON SEAT.—Melvin Jincks, Wallace, N. Y.
95,591.—STEAM ENGINE SLIDE VALVE.—Hans Knudsen, North Windsor, Wis.
95,592.—SASH HOLDER.—J. S. Kuder and Willoughby Seiple, Tiffin, Ohio.
95,593.—WATER WHEEL.—Dennis Lane, Montpelier, Vt.
95,594.—HEN'S NEST.—D. P. Leach, Franklin, Ind.
95,595.—LOW-WATER INDICATOR.—L. L. Lee, Milwaukee, Wis.
95,596.—FENCE.—William Mallary, Bucyrus, Ohio.
95,597.—WATER CLOSET FOR RAILROAD CARS.—W. E. Marsh, Jr., Plainfield, N. J.
95,598.—MOLDINGS OF WOOD.—W. J. Miller and J. W. Campbell, New York city.
95,599.—COFFEEPOT.—Elie Moneuse and Louis Duparquet, New York city.
95,600.—WASHING MACHINE.—Chas. Muhl, Bloomington, Ill.
95,601.—BOILER FURNACE.—G. H. Nott, Boston, Mass.
95,602.—SAW TEETH.—W. B. Noyes (assignor to himself and C. S. Baker), Manchester, N. H.
95,603.—SCREW FEEDING APPARATUS.—E. S. Pierce, Hartford, Conn.
95,604.—CONSTRUCTION OF ORDNANCE.—J. B. Read, Tuscaloosa, Ala. Antedated Sep. 27, 1869.
95,605.—SIRUP FOR FLAVORING BEVERAGES, ETC.—Victor Rillett, Hoboken, N. J.
95,606.—CALENDERING MACHINE.—H. E. Rogers, South Manchester Conn.
95,607.—GRAIN DRILL.—J. R. Rude, S. B. Rude, and G. W. Rude, Liberty, Ind.
95,608.—CIDER PRESS.—John Schaffer and Emanuel Stoner, Westminster, Md.
95,609.—SNAG BOAT.—E. M. Shield, Cincinnati, Ohio.
95,610.—COMPOUND FOR CURING TOOTHACHE.—W. P. Sigsby, Delta, Ohio.
95,611.—HAY ELEVATOR.—Anthony Smith, Shellsburg, Pa.
95,612.—REFRIGERATOR, SIDEBOARD, AND ROOM COOLER.—D. E. Somes, Washington, D. C.
95,613.—AIR PUMP.—D. E. Somes, Washington, D. C.
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95,619.—GRAIN DRILL.—W. H. Trimmer, Round Hill, Pa.
95,120.—HOTEL ANNUNCIATOR.—Lucius J. Vansands, Chicago, Ill.
95,621.—PIPE CONNECTION.—Augustus Weyermann, Saint Gall, Switzerland.
95,622.—SPRING FOR BEDS, BERTHS, CAR SEATS, ETC.—N. S. Whipple, Detroit, Mich.
95,623.—BOILER FOR COOKING STOVES.—Henry R. Robbins, Baltimore, Md., assignor to himself and J. J. Moran. Antedated Sept. 21, 1869.
95,624.—MODE OF APPLYING INKS OF DIFFERENT CHARACTERS SO AS TO PRINT SAFETY, REVENUE, AND OTHER STAMPS.—William Thorpe, St. Louis, Mo.
95,625.—HOOP SKIRT.—K. McRae, New York city.
95,626.—INK FOR PRINTING REVENUE, POSTAGE, AND OTHER STAMPS, SO AS TO SECURE GREATER SAFETY AND PREVENT FRAUDS.—Thos. Antisell, Washington, D. C.

REISSUES.

64,484.—BUCKET EAR.—Dated May 7, 1867; reissue 3,658.—Henry Callahan, John Reese, and R. S. Hoglen, Dayton, Ohio, assignees, by mesne assignments, of Henry Callahan.
35,141.—COOKING STOVE.—Dated May 6, 1862; reissue 3,659.—E. J. Cridge, Troy, N. Y.
57,743.—METAL FRAME FOR PIANOS.—Dated Sept. 4, 1866; reissue 3,660.—Martin Martins, New York city.
86,305.—METALLIC LATHING.—Dated Jan. 26, 1869; reissue 3,661.—I. V. Holmes, New York city.
45,272.—WASH BOILER.—Dated Nov. 29, 1864; reissue 3,662.—John Reist, Philadelphia, Pa.
91,388.—ATTACHMENT OF MAIN SPRINGS TO WATCH BARRELS, etc.—Dated June 15, 1869; antedated Dec. 15, 1868; reissue 3,663.—Arthur Wadsworth, Newark, N. J., for himself and Robert Schell, New York city, assignee of Arthur Wadsworth.
78,705.—SPRING SEAT.—Dated June 9, 1868; reissue 3,664.—J. L. Whipple, Detroit, Mich.
48,366.—TREMOLO ATTACHMENT.—Dated June 27, 1865; reissue 3,444, dated May 18, 1869; reissue 3,665.—Alonzo Hitchcock, George G. Saxe, and James H. Robertson. New York city, assignees of Riley W. Carpenter.

DESIGNS.

3,687.—BUCKLE.—Alma Bedford, Coldwater, Mich.
3,688.—CENTER PIECE.—Henry Berger, New York city.
3,689.—DRAWER PULL.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.
3,690 and 3,691.—LATCH HANDLE.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn. Two Patents.
3,692.—MATCH SAFE.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.
3,693.—SHUTTLE HOOK.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.
3,694 and 3,695.—SASH LIFT.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn. Two Patents.
3,696.—DOOR KNOB.—Stephen Eich, East Toledo, Ohio.
3,697.—MUFF.—J. K. Cappelhoff, New York city.
3,698 to 3,703.—CARPET PATTERN.—E. J. Ney, Dracut, Mass., assignor to Lowell Manufacturing Co. Six Patents.
3,704.—BELL.—F. G. Niedringhaus, St. Louis, Mo.
3,705.—TEA SERVICE.—Wm. Parkin (assignor to Reed & Barton), Taunton, Mass.
3,706.—KNITTED CAP.—Wm. Schwab, New York city.
3,707.—TRADE MARK.—George C. Thilenius, Cape Girardeau, Mo.

EXTENSIONS.

BORING MACHINE.—Arcalous Wyckoff and E. R. Morrison, of Elmira, N. Y.—Letters Patent No. 13,606, dated Sept. 25, 1855; reissue No 404, dated Oct. 14, 1856.
INTERLOCKING GRATE BARS.—S. Van Syckle, of Titusville, Pa.—Letters Patent No. 13,669, dated Oct. 9, 1855.

PATENT OFFICE DECISION RESPECTING DESIGNS---APPLICATION OF FRANKLIN FIELD FOR A PATENT FOR A DESIGN FOR PAPER COLLARS.

ON APPEAL TO THE EXAMINERS-IN-CHIEF—S. H. HODGES FOR THE BOARD.

It is true, as has been remarked in this case, that the differences between the design presented, and the one referred to by the Examiner in charge, are very slight. The lines in the respective drawings are nearly the same, and were nearly in the same direction. It must be remembered, nevertheless, that almost imperceptible variations in the lines of drawings often change the whole aspect of the images represented, and may cost intense study, and the exercise of the highest genius. The emotions indicated by the painting of a face may be entirely changed by modifications which would not be noticed by a stranger to the art. The novelty of a design is not to be determined, therefore, by the extent to which the lines are parallel to those of another, but the effect must also be taken into consideration.

The design which was referred to as being an anticipation of the one before us was intended to represent a collar with a hem. The purpose of the applicant is to represent a collar with a tape attached to the border, and his drawing is modified accordingly. The change, though slight in itself, produces the desired effect. This constitutes a substantial difference between the two, and precludes the one from being regarded as an anticipation of the other.

The decision of the primary Examiner is reversed.

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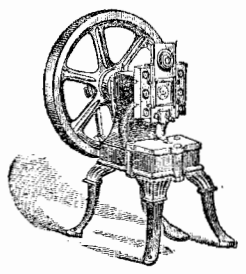

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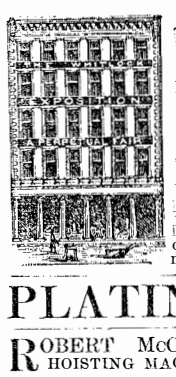

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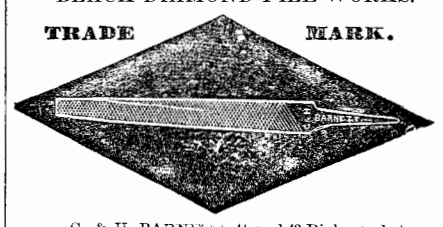

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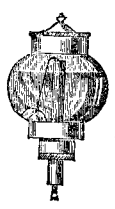

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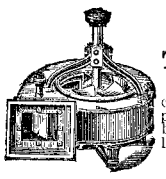

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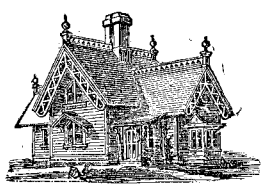

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